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ORIGINAL LECTURES.

SKIASCOPY; OR THE "SHADOW" TEST FOR THE DETERMINATION OF THE REFRACTION OF THE EYE.

A lecture delivered before the School of Ophthalmology.

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GENTLEMEN: In our studies of the methods of determining the refraction of the eye by means of the ophthalmoscope up to this time, we have dealt with those ordinarily employed, which gave an image, real or virtual, of the details of the fundus oculi—optic nerve entrance, retinal vessels, etc. These are the classical methods and will always remain in vogue, because of their indispensable value in general diagnosis; and for this reason they should be cultivated assiduously by all those who wish to make themselves proficient ophthalmoscopists.

There is, however, another method of ophthalmoscopic optometry, recently brought into practice, which, though based upon the same optical principles as these, differs from them in some points of practical detail. It is a method which has been enthusiastically recommended and endorsed by some, while by others, of equally good authority, it is regarded with indifference or distrust. There are those who look upon it as most inaccurate or unsatisfactory, but many regard it as probably the simplest and most trustworthy and valuable plan of objectively determining the refraction which we have at our command. The Germans use it scarcely at all; the French, among whom it originated, are divided in opinion as to its usefulness, while in England it is to-day the most generally adopted method for the ophthalmoscopic diagnosis for refraction. The eclectic character of the American is shown in this as in all other questions, and the "shadow-test" finds adherents and detractors in almost every town and city where scientific ophthalmology is practised. Its very simplicity of execution is brought forward as an argument against it, because, it is averred, if it should come into general use the other methods of ophthalmoscopic examination, particularly that by the direct method, which are so important on other accounts, would be neglected. I have yet, however, to learn, gentlemen, that simplicity is an objectionable quality in any procedure which is as accurate and reliable as others more complicated, and we have no need to fear that the determination of refraction by the ordinary methods of ophthalmoscopic examination are likely to fall into desuetude, "innocuous" or otherwise. No one method so completely occupies the field as not to allow room for one more; and even though you may adopt the shadow-test as a routine method of determining refraction, you will still find use for your refraction-ophthalmoscopes.

The method under consideration is known by a large number of names, no one of which is accurately descriptive of its underlying principles.[1]

Out of the multitude, I have selected one which seems to me, on the whole, the least objectionable and which is not likely to be confounded with anything else of a similar character.

The most prominent—in fact, the guiding—feature of the method, is the shadowy edge of an illuminated area which apparently passes across the pupillary space. In all descriptions of the method you will find that it is to this shadow bordering the bright area that attention is directed, and this being so and there being no other method of examination to which the term can be applied, the "shadow-test" seems, all things considered, about as appropriate as any that has as yet been suggested. It does not commit us to any special theory and there is no liability to confusion—two very strong points in nomenclature. If we want to be scientific and classical we may say "skiascopy" (σκιά, a shadow; σκοπέω, I look at).

The manner of performing skiascopy is very simple: Take an ophthalmoscopic mirror—plane or concave—and, holding it at a distance of forty or sixty inches (1 m. or 1.33 m.) from the eye to be examined, throw the light coming from a flame behind and above the head of the patient into the pupil. The pupillary space will, of course, appear brightly illuminated. Then rotate the mirror slightly on its vertical axis, and a brightly illuminated area, bounded by a dark shadowy edge, will appear to pass horizontally across the pupillary space. The intensity of the illumination and the direction and rate of its movement—or rather that of its shadowy edge—form the basis of the diagnosis of the refractive condition of the eye under examination.

How this is made possible it is our present purpose to inquire.

The phenomena of the shadow differ, accordingly as the experiment is made with a plane or a concave mirror,

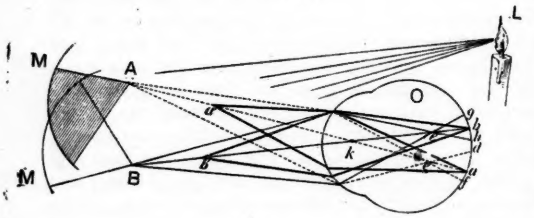
[1] It was called *keratoscopie* by its discoverer (Cuignet) and is still so-called by a number of French writers. This is a misnomer, for we do not inspect the cornea at all, and it plays only a part in the production of the phenomena. *Retinoscopy*, used almost altogether by the English, is equally incorrect, for we do not inspect the retina, but only the image of the bright image formed on the fundus, and which may not be on the retina at all, but on the optic disk. *Pupilloscopy* (*koroscopy*) is somewhat better chosen, since without a pupil to admit the light, we could have no phenomena; but it is evident that it is not the pupil we inspect or which gives us the information we seek. *Fantoscopie retinienne* is merely an approximation to the true explanation. *Retinoskiascopie* is somewhat better, while *dioptroscopie* can mean nothing, since we do not inspect, but measure, the refracting power of an optical apparatus.

the reason whereof will be very apparent when we have examined the matter a little further. We shall first study

SKIASCOPY WITH THE CONCAVE MIRROR.

When the light from a concave mirror of from 7 to 10 inches' focus (20 to 25 cm.) is thrown into the eye from a distance of sixty inches, the source of illumination is not the flame behind the head of the patient, nor the mirror itself, but the inverted image of the flame, L (Fig. 1), formed by the mirror, M, at its focus, A, which is, in this case, about forty or fifty inches in front of the observed eye, O. From this focus of illumination a cone of divergent rays proceeds, which forms a large circle of illumination on the face, a part only of the rays passing into the pupil. The light, however, that does pass in at the pupil is refracted by the optical media of the eye and finally strikes the retina.

FIG. 1.



Now, the manner in which these rays shall strike the retina depends upon the refractive condition of the eye. Let us suppose, in this instance, that the eye is myopic. In that case the rays proceeding from A will, after entering the eye, cross at *e′* and, passing on, form on the retina a diffusion image, *f d* of A, with its centre at *a*. This image, or bright spot, now becomes in its turn an illuminated object, sending out rays of light, just the same as if it were an originally luminous body. And just here is where I think many students of ophthalmoscopy find a hitch in their clear comprehension of the optical phenomena involved.

In the first place, you must remember that after the light gets into the eye and falls on the retina, the source of illumination is to be disregarded and we have only to do with the illuminated retinal surface, which might just as well have been illuminated from behind as through the pupil, as, indeed, we have already many times demonstrated to you on the artificial eye. We throw light into the eye not to get a reflection from the retina as from a plane bright surface like a mirror, but for the same reason that we open a window of a dark room, namely, to illuminate the objects we wish to see, and not to get a reflection of the sun and sky from these objects.

Another possible source of confusion, as I have found, is in the mistaken application of the law of conjugate foci. We have taught and demonstrated to you that in conjugate foci the image can replace the object, and the object the image, showing that the rays of light follow the same path going and coming. Its application in this instance, however, is not, as I have found many students to suppose, to the flame image A, and the illuminated area *d f*, but to the area *d f*, and its image at *a′*. The rays from the area *d f* do not cross at *e′* and go back to A, but diverge like the rays from any other illuminated object and, striking the refracting media in the front of the eye, are brought to a focus and form an image of it at the far point of the eye (*a′*), where an object must be, in order to have its image formed clearly and distinctly on the retina. In other words, *the retina and the far-point of the eye are conjugate foci.* We shall find this fact to lie at the basis of this method of examination and you should get it clearly fixed in your mind, otherwise there will come a point in your studies of it when you will find yourself in inextricable confusion.

Taking, then, *d f* as the illuminated object and assuming, as we have done, that the eye is myopic, an image of the area *d f* will be formed by the refracting media *in front* of the eye and at the conjugate focus of *d f*, that is, at the far point of the eye *a′*. Now the distance of the far-point *a′*, as we have learned, depends upon the degree of the myopia (that is, upon the amount of the increase in the length of the eyeball), being closer to the eye in the high degrees and getting farther and farther away as the degree decreases, until it reaches infinity, when myopia ceases and emmetropia sets in.

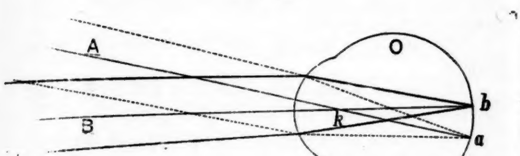
Suppose, now, we rotate the mirror on its axis from *M* to *M′*. The image of *L* will then move from *A* to *B*, and remaining, as before, the source of illumination, form on the retina the blurred image *g h*, the rays having crossed at *e*. The rays coming from this illuminated area *g h*, like those coming from *d f*, must come to a focus in front of the eye and form an image at the far point *b′*. In making this rotary movement of the mirror the following important changes will have been noted, viz., *that while the movement of the illuminated area on the retina has been the opposite of that of the mirror, the movement of the aërial image of this area, at the far point of the eye, has been in the same direction as that of the mirror.* If, therefore, on rotating the mirror before the eye, at a distance of sixty inches, we find the shadowy edge of the bright image to pass across the pupillary space in the same direction as the mirror, it shows that the image is formed between the mirror and the eye (at its far point), and consequently there must be M greater than 1 D. And not only that, but the amount of displacement of this aërial image, with its shadow, as compared with that of the mirror—that is to say, its rapidity of motion, will also depend upon the distance of the shadow from the eye; being slower and shorter when it is near and more rapid and more extensive as it recedes toward the mirror. The reason of this is at once apparent when we notice that the lines A *k* and B *k*, passing through the nodal point of the eye and upon which these images are formed, gradually approach as they go toward the eye and finally come together at the nodal point *k*. While, therefore, the *direction* of the shadow movement, *with the mirror,* gives us knowledge of the existence of the myopia, the relative *rapidity* of its movement gives us some knowledge of its degree, though only vaguely.

These phenomena are, of course, only possible when there is an actual aërial image of the illuminated retinal area formed between the observer and the eye under observation—that is, when, as in the case under consideration, the myopia is greater than 1.25 or 1.5 D., because when the myopia is lower than 1.25 D., the image is no longer formed in front of the observing eye, but the rays going to form it behind the mirror strike the eye of

the observer as they come immediately from the object —that is to say, the object and not its image, real or virtual, is seen; and, of course, any change in its position on the retina is observed in a direct manner; and as the movements of the bright area on the retina are the opposite of those of the image A and of the mirror, the shadow movement, in this case, will be the opposite, or *against* the mirror movement.

The same conditions are present, too, when the rays emerge parallel, as they do when the eye is emmetropic. In Fig. 2, the rays from the area at *a* emerge parallel in

FIG. 2.



the direction A, and when it moves to *b* in the direction B, and the image is at infinity, and is infinitely large. The eye of the observer, however, intercepting the rays in their course, forms the image on its own retina and sees it and its movements directly and as they are—that is, when *a* moves to *b*, from right to left, the movement appears, to the observing eye, to be from right to left.

In *emmetropia*, therefore, and in *low degrees of myopia* in which the far point is behind the mirror, the *movement of the shadow is against* that of the mirror.

We must have, necessarily, a very different set of phenomena when the eye is *hypermetropic* and the rays from the illuminated retinal area emerge divergently. (Fig. 3.) Here the bright area cannot be seen directly, as in emmetropia, or in the lower forms of myopia, nor is there a real image of it formed anywhere, as in myopia of the higher degrees.

The eye of the observer, however, placed in the path of the diverging rays, refers their origin to a virtual image, *e*, behind the eye (at its far-point, which, as you know, is negative in the hypermetropic eye), where they would all meet if prolonged backward. When the bright area is moved by the rotation of the mirror from *a* to *b*, the virtual image moves in the same direction from *e* to *f* —that is, *against* the movement of the mirror.

It will be noticed, too, that the more divergently the rays emerge from the eye—that is, the higher the degree of hypermetropia, the closer behind the eye will be the virtual image. As a result of this, the extent of movement of the shadow will be less the higher the degree of hypermetropia, gradually becoming greater as the degree increases, until it reaches infinity and the rays emerge parallel and the hypermetropia merges into emmetropia. It is easy to see that when the virtual image is at *e* and is displaced on rotation of the mirror to *f*, the extent of movement is less than when it is at *c* and displaced to *d*.

We thus see that the direction of the shadow movements, when the source of illumination is the image of a flame produced by a concave mirror held about forty inches in front of the observed eye, gives us positive and definite information as to the refractive condition of the eye, and we recapitulate it as follows:

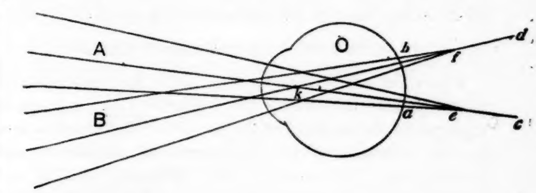
1. Movement of shadow *with* the mirror: myopia greater than 1 D.

2. Movement of shadow *against* the mirror movement: hypermetropia, emmetropia or myopia less than 1 D.

We know also, further, that the *movement is less the greater the amount of ametropia* (M. or H.).

As regards the *distinctness of the shadowy edge* and the intensity of the contained bright area, it is curious to note that diametrically opposite opinions are held.

FIG. 3.



Thus, Hartridge,[1] who is the latest English authority on the subject, says:

"It is in the lower degrees of ametropia that we get the brightest and best defined shadows. The clearness of the image and the brightness of its edge decrease as ametropia increases." (P. 87.)

On the other hand, Galezowski, in the last edition of his treatise on the eye, states:

"The shadow is darker and its movement slower in proportion as the ametropia is greater. Of these two peculiarities the first is due to the fact that the enlargement of the virtual image in H. and of the real image in M. is much less as the M. or H. attains a higher degree. The same quantity of light and shadow being distributed over less surface, the illuminated area is necessarily brighter and the shadow denser."[2] (P. 824.)

Both, it is very evident, cannot be right, and Mr. Hartridge is the more nearly correct. He neglected, however, to state that the brightest area with the best defined shadow in this method of examination is in that degree of myopia in which the image of the flame formed by the mirror lies at the far-point of the eye[3]—that is, when A and *a′* fall together (Fig. 1). This image is then at conjugate focus with the retina, on which a clear and sharply defined image is formed, and the image of this image, formed by the dioptric apparatus of the eye, which is the one we see, is also bright, with sharp edges. Now as the retina moves backward or forward from this position of conjugate focus (the mirror remaining in the same position)—that is to say, as the eye becomes hyperopic or myopic, the retinal image becomes larger in extent, but less bright and with more blurred outline, the same amount of light covering a larger area.

It should also be remembered, in this connection, that

[1] The Refraction of the Eye. By Gustavus Hartridge. Third edition. Philadelphia: P. Blakiston Son & Co., 1888.

[2] Traité des Maladies des Yeux. Par Dr. X. Galezowski. Third edition. Paris: J. B. Ballière, 1888.

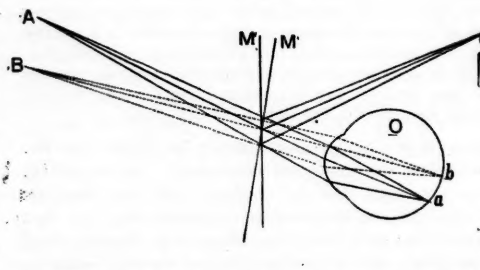
[3] Schmidt Rimplers's plan of determining refraction by the indirect method of ophthalmoscopic examination has its basis on this principle.

the size of the pupil controlling, as it does, the amount of light entering the eye (in fact, the retinal bright area is, to a degree, an image of the pupil) has much to do with the brightness of the image, as does also the amount of pigment at the part of the fundus on which the illuminated area is formed. There are so many factors entering into the production of the brightness of the image, which, after all, is only relative, that we cannot attach much signification to it as a diagnostic sign and can only say that as the retina and the source of illumination depart from the positions of conjugate foci, the retinal illuminated area becomes, *pari passu*, blurred in outline, and, of course, if its outline is blurred, the outline of its image must be proportionately blurred.

EXAMINATION WITH THE PLANE MIRROR.

The chief differences in the use of the concave and plane mirrors in making the "shadow-test" consist in changes in the position of the source of illumination and in the relations of the movement of the mirror and the shadow. The causes of this difference will be apparent at once on an examination of Fig. 4. The light diverging from the flame L behind the eye and falling upon the plane mirror M will be reflected and assume a direction as if it came from A, situated the same distance behind the mirror as L is in the front of it, A thus becoming the real source of illumination. These rays entering the eye O will form the illuminated area *a*. When the mirror is rotated to the position M′, in accordance with the same law, B becomes the source of illumination and forms the retinal bright area at *b*.

FIG. 4.



The relation of these movements to each other, it will be observed, are the opposite of those we found when using the concave mirror. There the source of illumination moved in the same direction with the mirror, here in the opposite direction; there the bright area on the fundus moved in the opposite direction to the mirror, here in the same direction. This necessarily entails a difference in the relative movements of the mirror and of the image of the retinal bright area, with its shadowy edge formed by the optical apparatus of the eye, and which we observe for diagnostic purposes. This image of the retinal bright area is always found on a line passing through the centre of the bright area and the nodal point of the eye, as shown in Fig. 1, and the same law, in this particular, applies to both methods, but it is apparent at a glance that those images formed *in front* of the mirror, between the observed eye and the mirror M, move *against* the mirror, while those formed behind the mirror (weak M.), and at infinity (E), and behind the eye (H), must move *with* the mirror.

The law regarding the *rate of movement* is the same here as with the use of the concave mirror.

As regards the *brightness* of the area and the sharpness of the shadow edge, what has been said under the head of the concave mirror applies here. It is apparent, however, that since the source of illumination is always behind the mirror, we can never have even one point where the brightness is as intense and the shadow so sharply defined as we can have it in some degrees of myopia with the other method, and for the simple reason that the conjugate focus of the retina and source of illumination, are never in front of the eye of the observer.

Recapitulating, then, the shadow phenomena with a plane mirror, we have:

1. Movement of shadow *with* the mirror—E., H. or weak M.
2. Movement *against* the mirror—M with its far-point between the observed and the observing eye.
3. The slower the movement the greater the degree of ametropia (M. or H.).

As regards the relative merits of the two methods, there exists quite a difference of opinion among those practising them. There is, however, one advantage connected with the use of the plane mirror, which has caused me to give it a preference over the concave in the usual routine examinations. Unless the concave mirror has a very long focus—longer than that of the mirrors of our ordinary ophthalmoscopes—it is necessary to keep comparatively close to the observed eye—certainly not farther away than sixty inches—in order to have sufficient illumination. If we get farther away than this, the cone of light becomes so large by the time it reaches the face that the manipulation of the mirror is rendered somewhat difficult and the illuminated area on the fundus so faint as to be almost indistinguishable, particularly if the eyes are dark. This makes it impossible accurately to detect myopia weaker than 0.75 D. With the plane mirror, however, the farther you get away from the eye under examination (within certain limits) the smaller the light area on the face becomes until the rays reflected from it become essentially parallel. This last point is reached when the distance from the mirror to the light is about one hundred inches. It is possible, with the plane mirror, to get from one hundred and twenty to one hundred and sixty inches from the observed eye, and have a fairly good illumination, and thus measure 0.25 D. of myopia if necessary.

Another reason for the more general use of the plane mirror, in this country at least, is that the concave mirrors on most of the ophthalmoscopes in use here are "tilting" segmental mirrors, ill-fitted for this method of examination. Besides, a plane mirror is very useful for other ophthalmoscopic purposes, and you should always have one on hand. I have combined the "tilting" and plane mirrors in my own ophthalmoscope[1] in a very convenient manner, by having the tilting concave mirror swung in front of the plane one. The plane mirror does not interfere in the least with the concave mirror when the latter is in use, and when it is desired to use the plane mirror alone, the tilting mirror can be detached in a second from its upper bearing and fastened below, leaving the plane mirror free. After a constant use of this

[1] Manufactured by Queen & Co., Philadelphia. For description see Trans. Amer. Oph. Soc., 1887.

instrument for over a year, I have every reason to be satisfied with the arrangement.

Up to this point, however, we have been able to tell only the kind, but not the *degree of ametropia*, except, in a general way, by the amount of shadow movement compared with what we know it to be in emmetropia. This is by no means sufficient for accurate diagnostic purposes. The simplest as well as the best means of accomplishing this is to place in front of the eye, under examination, glasses of a kind to correct the faulty refraction that is present, one after another, until one is found that gives an emmetropic shadow movement. For example: Suppose the examination is made by means of the concave mirror and at a distance of fifty-three inches (1.33 m.), and that the movement is *with* the mirror and rather slow as compared with the mirror movements. This, we know, is myopia—and at least of medium degree. We then put in the trial frame a — 3 D. and place it in front of the eye under examination and see what shadow movements we get through this. There is still movement with the mirror, but it is more rapid than before. This shows that there is myopia yet greater than 3 D. We try —4, and still there is movement with the mirror. A — 5 gives very slight movement against the mirror. This shows that the aërial image is formed behind the observing eye. If — 4.75 or — 4.5 give movement with, we may know that the — 5 D. has reduced the M. to about 0.75 — that is, to a myopia having a far-point at fifty-three inches (1.33 m.) from the eye, or near the observing eye. Add this to the — 5, and we have — 5.75 D. as expressive of the myopia of the eye under examination. In other words, find the weakest lens which at a distance of fifty-three inches from the eye gives a reverse movement, then add 0.75 and you have the lens required in myopia.

If it is hypermetropia, of course you must subtract 0.75, for in order to obtain a reversal of movement you have to induce a M. of 0.75 D., and a reversal produced by + 4, for instance, means a H. of 4.25 D., the other 0.75 being required to bring the far-point from infinity to the position of reversal in front of the observer. Of course, if the plane mirror is used, you can get much farther away, as far indeed as one hundred and sixty inches, where an ametropia of 0.25 D. can be measured directly—since the far-point of a myopia of 0.25 D. is at one hundred and sixty inches (4 m.), and where, necessarily, is found the point of reversal of shadow movement.

The disadvantages of the method you see at once to be the consumption of time in placing and replacing the different lenses in the trial frame in front of the eye. To obviate this, to some extent, Mr. Doyne, of Oxford, England, has devised a disk with a flange like the edge of a dinner-plate, in which is fitted a series of lenses. This disk is placed in front of the patient and while the flat surface stands obliquely to the plane of the face the flange with its lenses lies parallel to it and at right angles to the visual axis. The disk, which is about 1½ feet in diameter, standing thus obliquely, can be revolved on its axis in such a way as to bring the lenses successively in front of the eye under examination by a person with an arm of an average length at a distance of about fifty inches.[1]

Another method, first suggested, I believe, by Chibret, but also by Jackson, of Philadelphia, is to move the mirror toward the eye under examination until the point of reversal is found; then the distance from the observed to the observing eye marks the far-point of the eye under examination. This is an excellent method for rapidly detecting, in a rough manner, the degree of myopia; and for other cases an artificial myopia can be induced by means of a convex lens of a known focus. The point of reversal through this lens being found, the strength of the lens is to be subtracted from the myopia thus manifested.

If, for example, we use a + 5 D. with a focus of 20 cm. (eight inches) $\left(\frac{100}{\text{XX}} = 5\right)$ and we find the point of reversal at 20 cm., we know there is emmetropia (5—5= 0). If the point of reversal is at 33 cm. (thirteen inches), we have $5-\left(\frac{100}{\text{XXXIII}}=\right)3 = 2$ D. of hypermetropia; if at 50 cm. (twenty inches), $5-\left(\frac{100}{\text{L}}=\right)2 = 3$ D. of H., and so on. If there is H. higher than 5 D., we must use a + 8 D. or even + 10 D. in the trial frame.

THE DETERMINATION OF ASTIGMATISM.

Probably the most valuable application of the shadow test is to the unravelling of the tangled and complicated threads of evidence which so often present themselves in determining astigmatism. A few movements of the mirror are often sufficient to fix the character of an astigmatism, concerning which a tedious examination with glasses failed to give any satisfactory knowledge.

The ease with which this is done is readily understood when we remember that astigmatism is only a difference in the refraction of the opposing meridians of the eye and that we can, by changing the axis of rotation of the mirror, test successively the refraction of each separate meridian. We are further assisted, moreover, in determining astigmatism by some peculiarities of shadow-movement due entirely to the astigmatic refraction.

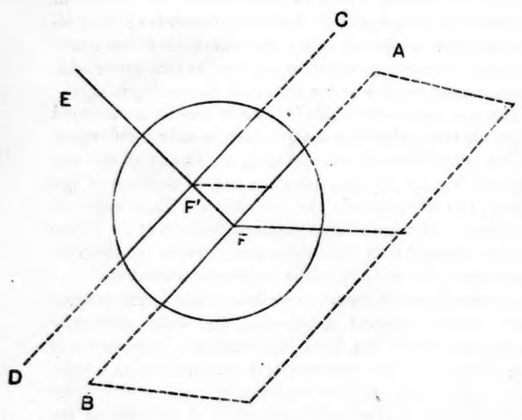
In testing for astigmatism we follow the same general plan as for general ametropia, the only difference being that we do not limit the rotation of the mirror to one direction. We rotate first horizontally then vertically, and if the shadow movements are of the same character and degree and particularly if the edge of the shadow always moves strictly in the direction of the mirror movement (with or against), we may know that no astigmatism exists. If, however, we find a difference either of kind or amount of shadow movement in the opposing meridians, or that the shadow edge moves obliquely to the mirror movement, astigmatism certainly is present.

The obliquity of shadow movement is not only valuable in giving us knowledge of the existence of astigmatism, but especially in showing us the direction of the faulty meridian. The reasons for this are as follows:

[1] Since the MS. has been in the hands of the printer I have myself arranged a disk of hard rubber containing 25 lenses, each 3 cm. in diameter, in such a way as to enable the patient to revolve it and bring each one successively, as required, before the eye under examination. The disk can be attached to a stand or fastened by an arm to the wall of the ophthalmoscopic room. I find it to be easily manipulated, and, enabling the observer to get at a greater distance from the patient, is more convenient than the apparatus of Doyne. A graduated tape, attached to the disk, enables the observer to tell exactly his distance from the observed eye.

In our studies of astigmatism we found that the image of a point, or circular area of light formed by an astigmatic system, was not a point but a series of ellipses whose axes coincided with the greatest and least refracting meridians. Now, the image of the light spot on the fundus, formed by the astigmatic refracting media of the eye, is likewise an ellipse with its axes corresponding to the meridians of least and greatest refraction. Moreover, the ellipse is so large that the small part of it that is seen by the observer passing across the pupil space appears almost straight, as, indeed, does the edges of the circular image in the non-astigmatic eye. When, however, there is an obliquity of the axis of the faulty meridian, and the mirror is rotated horizontally, we will say, the shadow does not appear to pass horizontally across the pupil, but in a direction at right angles to the axis of ellipse. You can demonstrate this experimentally by holding a body with the straight edge behind a round opening in a board, as A B Fig. 5, and moving it horizontally to C D. Although the movement may have been strictly horizontal, the apparent movement, as seen through the opening, will be in the direction of E, at right angles to the edge. So you have only to make the rotations of the mirror horizontally and vertically and the direction in which the edge of the shadow moves will indicate the direction of the faulty meridian.

FIG. 5.



To determine the amount of astigmatism, the same plan precisely is to be followed as in the determination of general ametropia—that is, we work out the refraction in each meridian separately with spherical lenses or by finding the point of reversal of movement, in the manner already indicated. In these examinations of each separate meridian we should always make the rotation of the mirror strictly at right angles to its axis and in the direction of the shadow movement, otherwise there are likely to be confusion and error, particularly when one meridian is at or near 45°.

When the kind and degree of the astigmatism have been thus determined, a cylinder suitable for the correction is placed in the frame with the axis in the direction indicated in the examination. The shadow movement should then be the same on rotation of the mirror in all directions; and when there is general ametropia present (compound astigmatism), the addition of the correcting spherical lens should give emmetropic movements.

A few general observations and we are done. The examination is somewhat easier when the pupil is large, but the necessity for a mydriatic is felt far less in this than in the direct ophthalmoscopic method. The flame should be behind and, by preference, above the head of the patient and the face as free as possible from light other than that from the mirror. It has been called a simple method of testing the refraction, and so it is; but simple as it is, it cannot be mastered without painstaking care as to the smaller details; and considerable experience is necessary before it can be executed with the rapidity and certainty of which it is capable, and which are among its recommendations to the practitioner. It will not supplant all other means of determining refraction, but it is certainly scientific, as we trust we have shown, and by care and patient practice can be made as reliable as any.

ORIGINAL ARTICLES.

THE POISONOUS EFFECTS OF CIGARETTE-SMOKING.

BY WILLIAM L. DUDLEY, M.D.,
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THE fact that cigarette-smoking produces physiological effects differing to some extent from those of the cigar has led me to make the experiments which I record here, tending toward an explanation of it. The frequently ascribed cause of the difference: that of the adulteration of cigarrette tobacco with opium and other drugs and also the presence of arsenic in the paper are for many reasons unsatisfactory and insufficient. It is true, no doubt, that the tobacco in many of the less expensive brands is adulterated with cheap drugs and artificial flavors and that in the more expensive grades opium may be used; but I believe it to be equally true that many cigarettes are made of tobacco which is free from sophistication. The presence of arsenic in the paper is entirely out of the question.

Before describing the experiments in detail, I shall discuss "smoking" in general. In "smoking" it is, of course, necessary that the tobacco should undergo combustion to a greater or less degree. The principal elements found in tobacco are carbon, hydrogen, nitrogen and oxygen, and, of these, the carbon and hydrogen are combustible, while the nitrogen and oxygen are non-combustible.

Besides combustion, destructive distillation takes place in the pipe, cigar or cigarette, as the result of the heat and the exclusion of the oxygen of the air which has been completely used up in passing through the red-hot burning tobacco, in front of that which the fire has not yet reached. The products of this destructive distillation are ammonia, a yellow and very poisonous substance of disagreeable odor, called nicotianine, some nicotine (but most of

the latter has been destroyed by the heat) and many other products of minor importance.

The result of the combustion of the hydrogen referred to previously is water; and the products of the combustion of the carbon are carbonic acid gas, or carbon dioxide, and carbonic oxide, or carbon monoxide. Carbon dioxide is the result of the complete combustion of carbon, and carbon monoxide is the result of the semi-combustion of carbon.

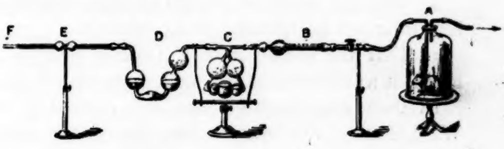
What is known, then, as tobacco smoke is a mixture of the products of combustion and of destructive distillation of the tobacco with the nitrogen of the air. The products of the combustion of the carbon predominate, if measured by volume, and of these carbon monoxide is in excess of carbon dioxide for the following reason: When carbon is burned in an excess of oxygen the result is carbon dioxide, and when this carbon dioxide comes in contact with red-hot carbon it is deoxidized and carbon monoxide is formed. This is seen in the combustion of charcoal, coke or anthracite in a grate or stove; the air passes through the grate bars and comes in contact with the red-hot carbon and carbon dioxide is formed; this gas is impelled by the draught to pass through the bed of glowing coals, and, in so doing, it is reduced to carbon monoxide, which, when it reaches the top, encounters a draught of air and burns with a pale blue, lambent flame, becoming oxidized to carbon dioxide again. This is similar to what takes place at the end of a cigar or cigarette or in a pipe, where there is a layer of fire from $\frac{1}{64}$ to $\frac{1}{16}$ of an inch in thickness, and as the air is drawn through it, carbon dioxide is first formed; on passing through the hot carbon this is reduced to carbon monoxide, and, as such, it is drawn into the mouth, for when it passes beyond the fire there is no air or oxygen to convert it back to carbon dioxide.

Now let us consider the properties of these products of the combustion of carbon: carbon dioxide will neither burn nor support combustion. It fails to support life, but is not poisonous; it simply produces death by suffocation. On the other hand, carbon monoxide does not support combustion, but burns with a pale blue flame. It fails to support life because it is extremely poisonous, and this is due to the affinity which it has for the hemoglobin of the blood. It has the power to expel all of the dissolved and loosely combined oxygen from the blood, and it converts the oxyhemoglobin into carbonic-oxide-hemoglobin, which, of course, results in death. The blood thus affected acquires a florid arterial hue, which differs from the normal color of the blood by its persistence. An animal plunged into an atmosphere of carbonic oxide, dies instantly, and, when small quantities mixed with air are breathed, headache, giddiness and insensibility readily occur. Death from carbonic oxide is easily proved by a spectroscopic examination of the blood of the victim.

There is a difference in the methods of smoking a cigarette and a cigar or pipe. In the two last-mentioned, the smoke is simply drawn into the mouth and expelled directly therefrom or through the nose, while the experienced cigarette-smoker will inhale the smoke—that is, draw it to a greater or less extent into the air-passages and in some cases to the greatest depth of the lungs, and thus the absorption of the carbonic oxide and other gases will take place very rapidly, causing more or less deoxidation of the blood and thereby impairing its power to build up the wasting tissues of the body.

Acting upon this theory I proceeded to experiment on animals and obtained for the purpose some mice. The animal to be experimented with was placed in a glass bell-jar, into which the smoke of a cigarette mixed with air could be drawn as rapidly as desired by means of a laboratory aspirator.

In the first experiment the smoke was purified as much as possible, and the atmosphere breathed by the animal was practically oxygen, nitrogen and carbonic oxide. The apparatus employed is shown in the accompanying figure.



The cigarette F was loosely inserted in the end of the tube E having two bulbs. D and C are bulbs containing a solution of potassium hydrate to absorb the carbon dioxide and any acids or condensable bodies not deposited in E. B is a tube containing solid potassium hydrate broken into small lumps, which retained any carbon dioxide that may have escaped the bulbs C and D. The animal was placed in the bell-jar and the apparatus connected together as shown in the figure. The aspirator, which was connected with the rubber tube leading from A, was turned on so as to draw a slow current of air through the apparatus in the direction indicated by the arrow. The cigarette was then lighted and in twenty-two minutes the animal was dead.

On examination of the blood of the animal by the spectroscope it was found that all of the oxyhemoglobin had been converted into carbonic-oxide-hemoglobin, which showed that carbonic oxide was the cause of the death. This experiment was repeated and the result was the same; the animal died in twenty-five minutes, and the spectroscope revealed the same condition of the blood.

A third experiment was made without the bulbs C and D and the tube B. The tube E, carrying the cigarette F, was connected directly to A, and thus

the smoke was drawn into the bell-jar without the removal of any of its original constituents. In this case the animal died in six minutes, and the examination again showed that the carbonic oxide was the immediate cause of death, proving that it was the most noxious constituent of the tobacco smoke. The time required to produce death in the last experiment was about one-fourth that required in the first and second. This was probably due to the fact that in the latter the smoking was done more rapidly than in the preceding, owing to the lessened resistance in the apparatus and the difficulty encountered in reducing the force of the aspirator. In each case, however, the amount smoked up to the time of death was about the same, one and one-fourth cigarettes.

From these experiments I feel justified in drawing the following conclusions:

1. That carbonic oxide is the most poisonous constituent of tobacco smoke.
2. That more injury results from cigarette than cigar- or pipe-smoking, because, as a rule, the smoke of the former is inhaled.
3. That cigarette smoking without inhaling is no more injurious than pipe- or cigar-smoking.
4. That the smoke of a cigar or pipe, if inhaled, is as injurious as cigarette smoke inhaled.
5. That the smoke from a Turkish pipe, if inhaled, is as injurious as that of a cigarette inhaled.

In these experiments I was ably assisted by Mr. W. J. Pulley, who was at the time doing special work in physiological chemistry under my direction.

THE NATURE OF THE ROTATION WHICH THE HEART UNDERGOES IN ACQUIRED DEXIOCARDIA, AS SHOWN BY THE AUTOPSIES IN TWO CASES.

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LATERAL displacement of the heart is of interest chiefly to the pathological anatomist, and from the standpoint of diagnosis. Its bearing upon the therapeutic measures employed in any case in which it occurs is too slight to be here considered. Neither is it desirable to review the literature of the subject at length, inasmuch as it is coextensive with that of diseases of the heart and lungs. Following in the footsteps of Stokes, all writers on diseases of the chest have discussed at greater or less length the various displacements which the heart may undergo as a result of abnormal conditions of the pleuræ or lungs as well as of itself and its great vessels. Of the many changes in position to which the heart may be subjected, it is the displacement to either side, and, again, that to the right, known as dexiocardia, which have aroused the greatest interest. There are several reasons for this: 1. The pulsation of the heart in the right side of the chest is a more startling deviation from nature than any displacement that still keeps the organ to the left of the sternum. It early arrests the patient's attention and excites his apprehension, while it is hardly possible to be overlooked by the physician even without the aid of a careful physical examination. 2. Cardiac displacements to the right or left are the results of intrathoracic affections of such severity as to concentrate the attention upon the chest, and they take place with greater rapidity than those in which change of position accompanies a lesion of the heart itself or its supports. 3. Transposition of the heart to the right of the sternum not only constitutes a phenomenon readily discoverable from without, but necessitates grave alteration in the anatomy of the parts, in consequence of which it would seem that profound functional disturbance must be inevitable. It is not difficult to understand, therefore, why of all cardiac displacements dexiocardia should awaken the deepest interest.

The chief causes of acquired dexiocardia are: 1, effusion of air or liquid into the left pleural cavity by which the heart is pushed over into the opposite side; 2, inflammation of the right lung with its investing membranes, which leads to their adhesion with the pericardium, and, through subsequent contraction, to the drawing of the heart to the right of the median line. As might be expected, conditions that exercise traction upon the heart operate more powerfully than such as push it out of position toward the right. In cases of left-sided effusion sufficient to crowd the heart beyond the median line, the organ is generally seen to pulsate in the neighborhood of the right nipple, somewhat to the inner side and "between the fifth and seventh ribs."[1] The effusion is rarely so great as to push the heart's apex to the outer side of the right mammary line. Hence the organ comes to occupy a position on the right side almost identical with that it formerly held on the left. In such cases, too, the transposition may take place with remarkable rapidity. Thus Walshe observes: "In cases of left effusion the organ may pulsate outside the right nipple, and thirty-six hours will sometimes suffice to produce this amount of malposition."[2]

When the dexiocardia is owing to traction through the shrinkage of pleuro-pericardial adhesions with, at the same time, cirrhosis of the lung, the heart may come to lie wholly to the right of the sternum. "Dr. Greenhow[3] gives a case of contraction of the right lung, the precise condition of which was un-

[1] Stokes on Diseases of the Chest (Dr. Hudson). Sydenham edition, London, 1882, p. 508.
[2] Walshe on Diseases of the Lungs. Third edition, 1860, § 778.
[3] Path. Trans, xix. 159.

known, observed by him during life, in which the heart was displaced very far to the right and upward, and was felt beating in the third and fourth spaces over an area of three inches by three inches and a half, of which the right nipple formed the central point."[1]

I have reported a case[2] of cirrhosis of the right lung in which the heart occupied a transverse position wholly to the right of the sternum. It formed a pulsating prominence extending from a line three inches below the clavicle to the upper boundary of hepatic dulness and from the right border of the sternum to a point two and three-fifths inches outside of the nipple, a transverse distance of five and a half inches.

That the heart can become so extensively displaced without serious interference with its function is not the least remarkable fact associated with this condition, for whatever disturbance of the general health is manifested appears to me to be the result not so much of the change in the position of the heart as of the concomitant disease of the lung or pleura. *Apropos* of this Schroetter remarks: "The change in the position of the heart as such, as a rule, occasions no functional disturbance. The more extreme displacements, however, may, from interfering with the normal contractile power of the heart or insufficient filling of its cavities, give rise to a tendency to stasis and its results."[3]

Whether any change in the cardiac sounds, and, if so, what change may be produced by these dislocations, is a question of considerable interest. Relative hereto Stokes observes: "The experience of upward of twenty cases has convinced me that this dislocation of the heart, even when at its greatest degree, does not cause any alteration in the natural sounds of the organ; indeed, it is singular how little its action is excited in many of these cases."[4] In this respect Walshe[5] asserts that his experience accords with that of Stokes. Hope, on the other hand, cites one of his cases in which murmurs were heard with the first sound, and queries, "Is it, therefore, possible that a twist given to the aorta, or pressure of the vessel against the ribs, may be the cause of a murmur under such circumstances?"[6] Schroetter coincides with Hope in the opinion that adventitious sounds may be generated by the twisting or bending of the great vessels. He says, "in such cases murmurs may be developed over the great vessels which simulate lesions of the valves."[7] He cites a case of great displacement of the heart to the left and downward, from pleuritic effusion, in which he heard a systolic murmur during life, but was not able to discover any lesion of the valves after death, and hence concluded that the murmur had been due to stretching of the aorta. In my case cited above there was a systolic bellows murmur heard most distinctly at a point two inches above the right nipple, while at the same spot the second sound became distinctly reduplicated. Nearer the sternum the murmur was lost, the first sound was impure and the highly accentuated second appeared at times to merge into a short, rough bruit. As will be seen later on, in the description of my two other cases, murmurs were likewise audible. Unquestionably, in many cases, murmurs may exist which depend upon an alteration in the quality of the blood rather than any distortion of the heart or large vessels. Nevertheless a moment's reflection upon the probable mode of production of blood murmurs makes it appear hardly possible for an acquired dexiocardia to exist without the development of murmurs. More or less change from the normal configuration of the heart and great vessels is almost inevitable and hence gives rise to conditions favorable to the production of fluid veins—that is, sonorous vibrations within the blood stream. Moreover, it is not impossible for compression or twisting of the organ so to alter the shape of the *ostia* as to render the respective valves relatively incompetent.

Such conjectures are interesting, but the subject of chief concern relates to the deviations from their natural configuration which the parts present *post-mortem*. Were the apex and body of the heart no more movable than the base, the organ would necessarily be moved over toward the right *en masse* while still keeping its relative position to the long axis of the thorax. As it is, to quote the words of Sibson, "the apex forms throughout the lowest part of the heart, and it describes a segment of a circle or arc as it sweeps round from its natural position in the left side of the chest to the position of extreme deviation to which it may attain in the right side of the chest."[1] To enable the apex to make so extensive an excursion, the body of the organ has to undergo rotation upon its long axis, and it is in thus revolving that a twist is likely to occur. Most authors do not describe the manner in which the organ rotates. Sibson, however, whom contemporaneous English writers appear to accept as authority on the subject, discusses at some length the mode of rotation occasioned by lateral displacement. He illustrates by diagrams the state of things found by him in several cases. He says, "as the heart passes over from the left to the right side of the chest it gradually and necessarily turns over upon itself, hinging, so to speak, upon the vessels by which the heart is attached

[1] Reynolds's System of Medicine (Hartshorne), vol. ii. p. 447.
[2] A remarkable case of complete dexiocardia. THE MEDICAL NEWS, October 25, 1884.
[3] Ziemssen's Cyclopædia of Medicine, vol. vi. p. 184.
[4] Loc. cit. [5] Loc. cit.
[6] Hope on the Heart, American edition, 1846, p. 490.
[7] Loc. cit.

[1] Op. cit., p. 444.

to the lungs and the system, so that the right auricle is hidden, all but the top of its appendix, and instead of the right ventricle being in front of the left ventricle, all but its left border, it is the reverse, for the left ventricle hides a large portion of the right ventricle. The part of the right ventricle exposed is, however, not that near the apex, but near the pulmonary artery. The ascending aorta and pulmonary artery change their direction; they move to the right at their respective origins, but higher up they are retained in their places, the arch of the aorta at the end of its transverse portion, and the pulmonary artery at its bifurcation. The aorta and pulmonary artery, therefore, present not a front but a profile view, with a direction to the right."[1]

Concerning the cardiac revolution in these cases, the following is expressed by J. Mitchell Bruce:

"The tendency that the heart has to rotate or roll on one or the other of its axes is also affected by its attachments at the root. If the heart lay free in the pericardial cavity, there would be no limit to such rotation under the influence of pressure or traction. The base being fixed, rotation is greatly limited and does not occur to any extent except around the longitudinal axis; the left ventricle, for example, being rotated more forward or more backward as the case may be. Rotation around the transverse horizontal and the antero-posterior axis is very limited."[2]

From the foregoing it would seem that Sibson considers the rotation likely to take place in such a manner as to bring the left ventricle to the front; while Bruce contents himself with the statement that the left ventricle may roll either forward or backward.

Schroetter, on the other hand, expresses himself rather more positively when he says, "turning of the heart on its long axis generally occurs in such a manner that the right auricle and ventricle come to look more directly forward and the left cavities backward." "Bamberger relates a case of pneumothorax on the left side, in which the heart was not only pushed over to the right, as is usual, but had so revolved on its long axis that the greater portion of the left ventricle looked forward. This revolution was so considerable that torsion of both the great vessels could be easily recognized. It is hard to picture to one's self how this came to pass, inasmuch as there were no contracting bands found here, and it may be that, with an original tendency of the heart in that direction, a weak spot in its suspension gave occasion to the displacement and torsion."[3]

If the anatomy of the great arteries be considered, it would seem as if the heart could not well rotate in any other manner than as described by Schroetter—*i. e.*, from right to left backward. Were rotation of the entire organ to take place in the opposite direction—that is, from behind forward and from left to right—it would cause the pulmonary artery and its right branch to be wound tightly about the base of the aorta, thus greatly constricting its lumen. Fortunately the firm fixation of the base of the heart prevents this, and, as shown by my Case II., the rotation in this direction is achieved by a twist in the body of the heart. Doubtless, as intimated by Schroetter, in cases of dexiocardia due to pressure and without adhesions, rotation is more easily accomplished in the direction he describes. Yet, Sibson's Diagram 76, illustrating the rotation of the left ventricle in front of the right, represents what occurs in cases of left pleuritic effusion.

CASE I.—Walter F., æt. three years and four months, Irish, was first seen and examined by me May 21, 1884. There was history of some sort of intrathoracic disease during the first few weeks of life. He was extremely delicate up to his second year and always very prone to colds and coughs.

Status præsens.—Is fairly nourished; plays with other children, but is peevish and backward in mental devolopment; appetite capricious and bowels inclined to be too relaxed; has a loose cough and gets blue in the face when playing or running.

Inspection.—Pupils normal, slight cyanosis of the face and congestion of the veins of the chest, chiefly on left side; flattening of the anterior surface of left thorax, most marked in submammary region; a pulsating area at right of sternum, pulsation seen in third, fourth and fifth spaces; flattening of the latero-posterior and inferior aspect of right side of chest; epigastric pulsation.

Palpation.—Cardiac impulse diffused and apex-beat in fifth space below right nipple, not very forcible; pulse rapid, weak, regular, rate not counted.

Mensuration.—Left side at level of second rib, 26 centimetres and at fifth rib 24.9 centimetres, while on right side at corresponding levels the measurements are 28 centimetres and 27 centimetres respectively.

Percussion.—The note is resonant over left side, specially full at posterior base; no cardiac dulness at left of sternum, but beginning at its left edge above, an area of flatness passes downward and outward to the outer side of the right nipple. From this point the percussion note shades gradually off into faint resonance behind.

Auscultation.—Exaggerated puerile respiration throughout left side, with rhonchi at base. Upon right side posteriorly very feeble bronchial breath-sounds, and at base laterally dry friction sounds. The heart's sounds are loud, and the first somewhat obscured by a systolic murmur most distinct at apex but audible throughout the præcordia. This murmur seems composed of two, a short, low, harsh bruit that merges into a high-pitched bellows-like whiff at close of systole. The second sound is greatly accented, prolonged and impure.

Diagnosis.—Acquired dexiocardia; compression of right lung; old pleuritic adhesions of right side; secondary chronic bronchitis of left lung; possibly old adhesions of the left pleuræ.

[1] Op. cit., p. 445.
[2] Dictionary of Medicine, Quain, Amer. ed., p. 591.
[3] Op. cit., p. 177.

During the ensuing summer the little patient remained in fair health, but as winter approached his cough and expectoration increased, appetite failed, strength waned and in spite of appropriate treatment he died January 14, 1885, of broncho-pneumonia.

Only a partial *post-mortem* examination was permitted by the family in the presence of the father, and hence it was impossible to obtain the thoracic organs. The autopsy was conducted by Dr. F. C. Schaefer, Professor of Anatomy at Chicago Medical College, in the presence of Dr. W. W. Jaggard, a student and myself.

The following is the report, together with the illustration, as kindly furnished by Dr. Schaefer. The autopsy took place sixteen hours after death.

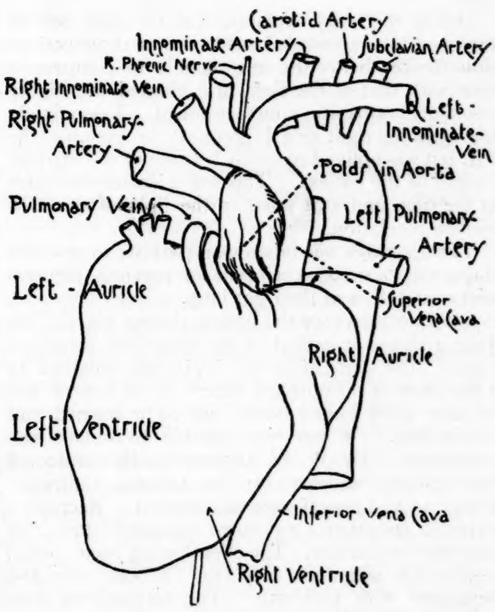
The right innominate vein was adherent to the second costal cartilage and extended partly across the anterior surface of the aortic arch toward the left side having been carried over by the rotation of the heart from right to left, forward. The pericardium was attached to the right half of the sternum and to the corresponding right costal cartilages; also to the rib surfaces about one inch to the right of the cartilages. The right lung was crowded back into the fossa between the bodies of the vertebræ and the ribs, and was almost completely collapsed. The apex of the heart pointed an inch higher on the right side than the usual position on the left side. The extreme left boundary of the pericardium was *two* inches to the left of the median line, while the extreme right boundary was placed at the distance of three and one-half inches to the right of the median line. Upon opening the pericardium a small quantity of serum escaped from the sac, and fresh deposits of lymph were visible upon the heart's surface. The sac was unusually large. The first section of the aortic arch joined the second section at an obtuse angle, owing to the elevated position of the heart. The right ventricle presented to the front. The posterior surface of the right auricle could be seen in front and to the left, its anterior surface having been turned back looking toward the vertebræ. The left auricle, twisted upon its vertical axis, came partly into view in front and to the right. The inferior vena cava also twisted upon itself, from right to left, was visible in front, near the left side of the heart (Fig. 1). The right pulmonary artery was on a plane superior and posterior to that of the left one. The pulmonary veins were greatly stretched,—the right one was almost tense. The three large branches of the aortic arch were in the normal position. The heart was enlarged a little more than one-half and twisted upon its vertical axis from behind forward, and from right to left. Distinct folds existed in the first section of the aortic arch. These folds were almost vertical in direction, and were obliterated by rotating the heart in the reverse direction. This portion of the aortic arch was dilated to the extent of two diameters, and its walls were very thin. At the junction of the first and second sections of the aortic arch there existed a firm, cord-like annular constriction almost completely surrounding the vessel. This ring-like band was formed by the superior vena cava and the right innominate vein; these vessels having accompanied the right auricle in its rotation; the extent of this rotation having been so great as to cause the anterior surface of the right auricle to look backward, thus crowding the superior vena cava under the arch of the aorta; the right innominate vein joining the superior vena cava in front of the aorta as represented in Fig. 1.

The left innominate vein was folded back just before it joined the right vein to form the superior vena cava. The right phrenic nerve descended behind the heart.

The auricles were a trifle enlarged and very irregular in outline, being curved upon their vertical axes. Both ventricles were enlarged, the right one about one-third; the left one to about three times the normal size. Its walls were about half the usual thickness. This great increase in size of the left ventricle was doubtless caused by the resistance occasioned by the constriction of the aortic arch. (Fig. 1.)

There can be no doubt about the direction of rotation in this case. The anatomical relations of the various parts connected with the heart indicate it too plainly to admit of a wrong interpretation. (Fig. 1.)

FIG. 1.



CASE II.—George E., æt. eighteen years, American, was seen for the only time March 31, 1885. History: His older brother died of consumption a year or two ago. Patient has been ill for over a year, and during the summer of 1884 was so ill with some intrathoracic inflammation that he only recovered with difficulty and slowness. Since then he has noticed that his heart beats on the right side. *Status præsens.* Symptoms: profound weakness, anorexia and diarrhœa, daily fever, annoying cough with but slight expectoration. Inspection: patient sits propped up in an easy chair, is extremely weak

and emaciated, phthisical habitus marked, and breathing so superficial as to cause scarcely perceptible movements of the chest. Cardiac impulse visible just below the right nipple. Pulse 124, very feeble, and respirations 38.

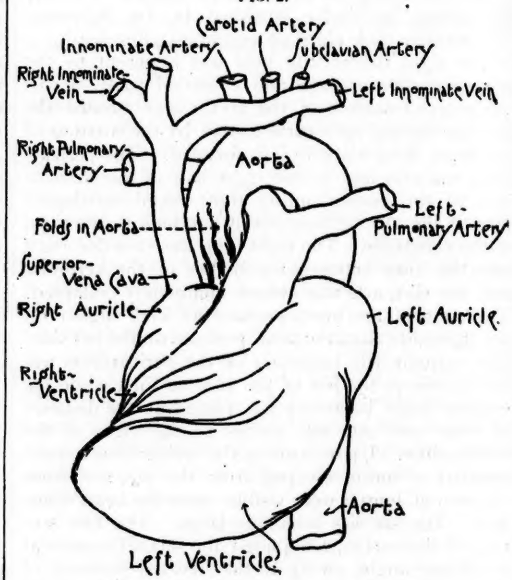
Owing to the prostration of the patient only a partial, hasty physical examination could be made and my notes are very meagre, as follows: Percussion: from junction of second costal cartilage with right border of sternum a line of dulness runs obliquely downward and outward to half an inch outside of right nipple, thence passes along the lower border of the fourth rib to the sternum, and from this point upward obliquely to the junction of the left second costal cartilage with the sternum, and thence across this bone to the starting point. The upper margin of hepatic flatness is at the upper border of the sixth rib. Percussion note over the balance of this half of the thorax is faintly resonant, but not so much so as over left lung, where it is hyper-resonant and tympanitic, very drum-like. Auscultation: over right lung, posteriorly, respiration is bronchial and voice bronchophonic and râles of indefinite character. Heart sounds are accented and a systolic bellows murmur accompanies the first over the body of the heart.

During the hasty exploration of the right half of the chest just recorded I made two or three percussion strokes below the left clavicle to compare its note with that of the right and elicited the highly resonant, tympanitic note mentioned. Upon finishing with the right side I prepared to examine the left, but was obliged to desist because of the extreme fatigue of the patient. This was a matter for regret at the time and still more in the light of the *post-mortem* revelation.

The diagnosis was tubercular phthisis in the last stage, dexiocardia as a result of previous pleuritis and contraction of the right lung.

I did not again see the patient during his life, but June 27th was informed of his death two days previous. The consent of the family was obtained to a *post-mortem* examination which, as the funeral was to take place in two hours, had to be hurried and incomplete. It was not possible to obtain any specimens. Dr. W. W. Jaggard kindly conducted the autopsy, assisted by Dr. Charles Caldwell; a student and myself were also present. Necropsy: external appearance not noted because of too great *post-mortem* changes. The chest having been opened —pleuritic adhesions very firm on both sides and separated with difficulty. The pericardium contains no fluid, but is firmly adherent to the heart. Miliary tubercles on both its visceral and parietal layers, most numerous at the base. The left half of the thorax is converted into a complete cavity, no lung tissue found, but the cavity is lined by a cheesy material closely resembling pus. About a pint of pus found at bottom of the cavity. All the bronchi leading into this cavity are occluded. The right lung is crowded back, infiltrated with tubercles and displays numerous calcareous deposits. The heart lies with its left border near the middle of the sternum and is rotated from left to right forward, so that the left ventricle is in front. The apex is at the right of the sternum. The pulmonary artery runs up from the middle of the sternum toward the left, covering the aorta. The aorta is twisted on its axis about ninety degrees backward. The superior vena cava lies to the right and behind the aorta. The inferior vena cava is slightly twisted backward to the left. Both ventricles are thin-walled and dilated. There is a double twisting of the heart, both on its long and transverse axes. The liver is in its normal position. Owing to limited time the abdominal cavity is not examined.

FIG. 2.



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This proteid is identical with the serum-albumin of the blood and, therefore, belongs to the group of native albumins, of which egg-albumen may be considered a typical representative. It is readily soluble in water, but is insoluble in alcohol. Like other proteids, it is soluble in acids and alkalies, yielding corresponding acid and alkali albuminates. It is coagulated by heat and by acids and, furthermore, gives precipitates with most of the alkaloidal reagents.

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and emaciated, phthisical habitus marked, and breathing so superficial as to cause scarcely perceptible movements of the chest. Cardiac impulse visible just below the right nipple. Pulse 124, very feeble, and respirations 38.

Owing to the prostration of the patient only a partial, hasty physical examination could be made and my notes are very meagre, as follows: Percussion: from junction of second costal cartilage with right border of sternum a line of dulness runs obliquely downward and outward to half an inch outside of right nipple, thence passes along the lower border of the fourth rib to the sternum, and from this point upward obliquely to the junction of the left second costal cartilage with the sternum, and thence across this bone to the starting point. The upper margin of hepatic flatness is at the upper border of the sixth rib. Percussion note over the balance of this half of the thorax is faintly resonant, but not so much so as over left lung, where it is hyper-resonant and tympanitic, very drum-like. Auscultation: over right lung, posteriorly, respiration is bronchial and voice bronchophonic and râles of indefinite character. Heart sounds are accented and a systolic bellows murmur accompanies the first over the body of the heart.

During the hasty exploration of the right half of the chest just recorded I made two or three percussion strokes below the left clavicle to compare its note with that of the right and elicited the highly resonant, tympanitic note mentioned. Upon finishing with the right side I prepared to examine the left, but was obliged to desist because of the extreme fatigue of the patient. This was a matter for regret at the time and still more in the light of the *post-mortem* revelation.

The diagnosis was tubercular phthisis in the last stage, dexiocardia as a result of previous pleuritis and contraction of the right lung.

I did not again see the patient during his life, but June 27th was informed of his death two days previous. The consent of the family was obtained to a *post-mortem* examination which, as the funeral was to take place in two hours, had to be hurried and incomplete. It was not possible to obtain any specimens. Dr. W. W. Jaggard kindly conducted the autopsy, assisted by Dr. Charles Caldwell; a student and myself were also present. Necropsy: external appearance not noted because of too great *post-mortem* changes. The chest having been opened—pleuritic adhesions very firm on both sides and separated with difficulty. The pericardium contains no fluid, but is firmly adherent to the heart. Miliary tubercles on both its visceral and parietal layers, most numerous at the base. The left half of the thorax is converted into a complete cavity, no lung tissue found, but the cavity is lined by a cheesy material closely resembling pus. About a pint of pus found at bottom of the cavity. All the bronchi leading into this cavity are occluded. The right lung is crowded back, infiltrated with tubercles and displays numerous calcareous deposits. The heart lies with its left border near the middle of the sternum and is rotated from left to right forward, so that the left ventricle is in front. The apex is at the right of the sternum. The pulmonary artery runs up from the middle of the sternum toward the left, covering the aorta. The aorta is twisted on its axis about ninety degrees backward. The superior vena cava lies to the right and behind the aorta. The inferior vena cava is slightly twisted backward to the left. Both ventricles are thin-walled and dilated. There is a double twisting of the heart, both on its long and transverse axes. The liver is in its normal position. Owing to limited time the abdominal cavity is not examined.

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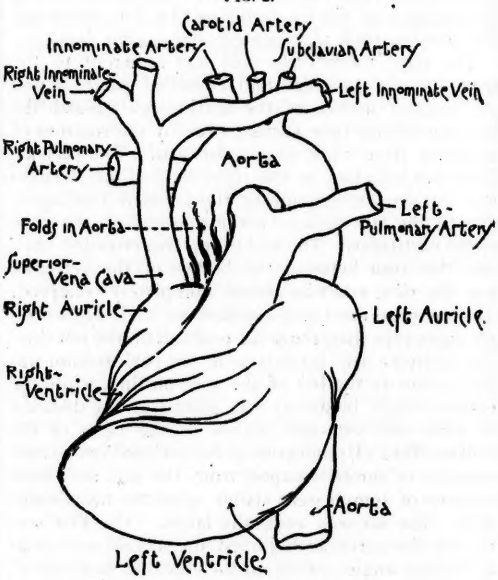

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present. Thus, in three cases of cyclic or functional albuminuria and one of puerperal albuminuria, he found the proteid of the urine to consist solely of globulin. A short time ago I had under observation what appeared to be a case of functional albuminuria. The individual was a student, apparently in good health; indeed, to use his own words, he "never felt better in his life." The urine had a specific gravity of 1024, was acid in reaction and, on standing, yielded a deposit of uric acid. When passed after rising and just before breakfast, the urine contained no albumin, but shortly after breakfast it appeared. Globulin was found to be present, but, unfortunately, I am unable to give the exact figure as to the amount present.

Globulin is an amorphous, pulverulent powder, insoluble in water and alcohol. In the urine it is held in solution, not by the water, but by the salt; and hence, when globulin-containing urine is diluted with water it yields a cloudy precipitate, inasmuch as the salt, owing to the dilution, is no longer capable of holding the globulin in solution. In other words, globulin is soluble in dilute salines, but is insoluble in water or in concentrated salines. From dilute solutions it is precipitated by passing carbonic acid; but a better method for the isolation of globulin is that of Hammarsten.[1] It is based upon the fact that globulin is insoluble in concentrated salines, and is essentially as follows: Finely pulverized magnesium sulphate is added to the neutral or but slightly acid urine in successive portions till complete saturation is reached—that is, to the point when the urine ceases to dissolve any more of the salt, even on prolonged standing. The globulin is thus precipitated, whilst the serum-albumin remains in solution. The precipitate is gathered upon a filter and washed thoroughly with a saturated solution of magnesium sulphate. The globulin can now be dissolved from the precipitate by the aid of a dilute saline solution, and the amount determined by precipitation and subsequent weighing. The albumin can be determined in the combined filtrate and washings by precipitation with heat and nitric acid. The coagulated albumin is collected upon a previously weighed filter paper, then washed, dried and weighed.

Kühne[2] applied the term hemi-albumose to a group of intermediate proteid products which are formed by the action of digestive ferments or boiling acids on various proteids. It, therefore, occupies a middle position between the genuine proteids—as, for instance, serum-albumin and the final products of digestion, namely, peptones. This peculiar substance was first observed by Bence Jones,[3] in the urine of a case of osteomalacia, and since then has frequently been designated as "Bence Jones albumin." Subsequently, Kühne and Chittenden,[1] as well as Salkowski,[2] have contributed extensively to our knowledge of this interesting albuminoid, which, it seems, is invariably present in osteomalacia. Kühne[3] describes the urine in a case of osteomalacia containing hemi-albumose, as follows: It was yellow, clouded, strongly acid and had a sediment of uric acid, sodium urate, mucous corpuscles and amorphous granules; on shaking, it foamed like soap, but it filtered clear.

The chemical behavior of hemi-albumose is quite peculiar and at the same time distinctive from that of the other proteids that may occur in urine. Thus, when warmed, it yields a heavy, flocculent precipitate, which, as soon as the temperature approaches the boiling-point, redissolves and the solution again becomes clear; but, on cooling, the precipitate reappears. The addition of nitric acid produces a heavy white precipitate, which, when the acid is added in slight excess, redissolves and does not separate on boiling and subsequent cooling. When the acid is added in quantity insufficient to dissolve the precipitate and the liquid is then warmed, the precipitate will dissolve just below the boiling-point and will separate out again on cooling. No precipitate is produced on neutralization with alkali or on the addition of dilute or concentrated acetic acid, or by passing carbonic acid through the diluted urine. This last reaction distinguishes it from globulin and can be made use of to separate these substances.

Hydrochloric acid acts like nitric acid, but the urine, on boiling with an excess of the acid, assumes a violet color. It gives proteid reactions with Millon's reagent and also with copper sulphate and alkali (biuret). Strong precipitates are produced by tannic acid, picric acid, potassium ferrocyanide and acetic acid; also by acetic acid and concentrated salt solution. It is completely precipitable by alcohol and can thus be removed from the urine. The white, flocculent precipitate produced by the alcohol is soluble in water and coagulates at 52° to 60° C. Instead of precipitation by alcohol, it may be isolated from the urine, according to Salkowski, by strongly acidulating the urine with the acetic acid and then saturating it with common salt. The precipitate, after washing, can be purified by dialysis.

A very peculiar characteristic of hemi-albumose is that it may exist in the urine in *deposit* as well as in solution. When in solution it coagulates at about 50° C. (122° F.), and, on further heating, as already stated, the precipitate redissolves and then, on sub-

[1] Zeitschr. f. Anal. Chemie, 24, 481.
[2] Verhandl. d. naturalist.-medecin. Vereins zu Heidelberg [N. F.], 1, 236.
[3] Ann. Chem. u. Pharm., 67, 97.

[1] Zeitschr. f. Biologie, 19, 159.
[2] Virchow's Archiv, 81, 552.
[3] Zeitschr. f. Biologie, 19, 209.

sequent cooling, reappears. Kühne has named the variety which exists in solution as genuine hemi-albumose and the insoluble variety as coagulated hemi-albumose. Now, this insoluble or coagulated hemi-albumose occurs in digestive fluids, and may also occur in urine as an amorphous granular deposit. The nature of this amorphous deposit can be ascertained in the following manner.

It is first extracted with water, then with dilute acetic acid or alkali. The coagulated hemi-albumose is easily soluble in very dilute acids and alkalies, and the solution on neutralization can be precipitated by alcohol. The precipitate thus obtained is first washed with alcohol and then dissolved in water. On the addition of a little common salt and warming, it should coagulate at between 40° to 60° C. (104° to 140° F.), and clear up again at near the boiling point.

In the presence of serum albumin and globulin, it can be detected by saturating the urine, strongly acidulated with acetic acid, with sodium chloride, boiling and filtering whilst hot. The albumin and globulin remain behind on the filter, whilst the hemi-albumose passes through and separates out as the filtrate cools.

By the term peptone we understand those end-products of the digestion of proteid substances which differ from the albumins proper in their solubility, diffusibility and in not coagulating either by heat or acids. So far as we know, the peptones do not possess the same composition, but differ among themselves according to the source, the particular proteid from which they are derived. The variety of peptone which occurs in the urine is commonly regarded as deriving its origin from pus corpuscles, which, as we know, may be present in a large number of pathological instances. According to Hofmeister,[1] these corpuscles experience a rapid decomposition, yielding, as one of the products, peptone.

Peptone may occur in the urine in the presence of serum-albumin, globulin or hemi-albumose, though it is not necessarily so accompanied. Indeed, the accompaniment of albumin and its congeners by peptone is rather an exception than a rule; a fact which is all the more striking, since we now know that the normal urine contains peptic as well as tryptic ferments. We would expect on *a priori* grounds, that when albumin, or any other proteid, is present in the urine, it would be acted upon by the ferments normally present and yield peptones. Further investigation is necessary in order to bring out more clearly not only the exact origin of the peptones in the urine, but also the significance they bear, if any, with regard to disease. It should be stated, however, that peptones may occur in the urine of healthy persons, though in very minute quantity.

When peptone is present in the urine in relevant quantity, it constitutes the so-called peptonuria, about which, however, very little is known. Peptones are characterized by their ready solubility in water, great diffusibility and in not giving precipitates with heat or acids. They are furthermore distinguished from albumin, globulin and hemi-albumose in not giving a precipitate with acetic acid and potassium ferrocyanide. They are, however, precipitated by metaphosphoric acid, phosphomolybdic acid, phosphotungstic acid, as well as by tannic and picric acids. The precipitate of the latter redissolves on heating, thus differing from that of albumin. According to Hofmeister,[1] the amount of peptone ordinarily present in the urine is so slight as to be insufficient to yield a precipitate with picric acid.

Peptones may be readily detected in the urine, if the other proteid substances are present or not. In the absence of other proteids the best plan is to add neutral acetate of lead as long as a precipitate forms, then to filter. To the filtrate, which should give no precipitate with acetic acid and potassium ferrocyanide (absence of albumin, etc.), about one-fifth of its volume of concentrated acetic acid is added, and then phosphotungstic acid, acidulated with acetic acid, when, if any peptone be present, a milky precipitate will appear.

In the presence of other proteids, the urine cannot be tested directly for peptone, but these constituents must first be removed. For this purpose the method of Hofmeister[2] is the best one we have and is carried out in the following manner: To about a pint of the urine two and a half drachms of concentrated sodium acetate solution are added, then a concentrated solution of ferric chloride till a blood-red color is developed. The acid solution is now neutralized with alkali as nearly as possible, boiled for a few minutes and, when cold, filtered. If care is taken to have the solution neutral or but slightly acid, all of the albumin, etc., will be precipitated, whilst the peptone will remain in solution and can be detected in the filtrate. This should give no precipitate with acetic acid and potassium ferrocyanide, but if peptone is present it will give a precipitate when it is acidified with acetic acid and an acetic solution of sodium phosphotungstate is added. This is the most delicate reagent for peptone and gives, according to Wolfenden, a distinct reaction in 1 to 100,000.

TESTS FOR ALBUMIN.

The oldest and best known tests for albumin are heat and nitric acid; but, of late years, a large

[1] Zeitschr. f. Physiol. Chemie, 4, 253.

[1] Zeitschr. f. Anal. Chem., 23, 116.
[2] Journal of Physiology, 7, 237.

number of new reagents have been proposed, some of which are of rather doubtful value. It was, therefore, desirable to compare as many as possible of these new tests, not only with reference to their behavior to normal urine, but also with respect to their delicacy in detecting variable amounts of albumin. For this purpose eighteen specimens of normal urine and five albuminous urines, some containing only traces of albumin, were examined with the following reagents, and the results obtained are sufficient to show the utter unreliableness of a large number of these so-called improved tests. It seems to me that the medical profession cannot exercise too much caution in accepting a new test or reagent which is intended to supply the place of the old but reliable ones. Every now and then we see some one come forward with an alkaloidal reagent and launch it forth as a delicate and characteristic test for albumin. These reagents, though they may be exceedingly delicate when pure solutions of albumin are examined, yet, when applied directly to the urine, not infrequently indicate albumin even when it is entirely absent.

1. *Heat and nitric acid.*—Only seven samples of urine gave, on warming, precipitates (of phosphates) which readily dissolved upon the addition of either acetic or nitric acid. That is, to say heat and acetic or nitric acid gave no precipitate in eighteen urines. Nitric acid is to be preferred to acetic acid, inasmuch as the test is much more delicate. If the urine is neutral or alkaline, it should be acidulated with a drop or two of acetic acid. The test is best applied by placing about eighty minims of urine into a test-tube and raising the upper portion to the boiling temperature. Whether a precipitate forms or not, about one-tenth volume (five to ten drops) of nitric acid is added; if a permanent cloud or precipitate remains, albumin is present.

2. *Nitric acid alone. Heller's contact test.*—To about a drachm of urine in a test-tube about half a drachm of concentrated nitric acid is added in such a way that the liquids do not intermix, but form two distinct layers. A grayish precipitate of albumin will soon form at the plane of contact; but when the albumin is present in minute quantity, it is necessary to wait a few minutes. A white, amorphous precipitate of urates may come down when the urine is concentrated, but it is distinguished from that of albumin by forming, not at the plane of contact, but higher up in the liquid and, moreover, by its ready solubility upon the application of heat. The test is very conclusive and extremely delicate. It is said to be capable of indicating as little as 0.003 per cent. of albumin. It was not given by any of the eighteen specimens of normal urine, but failed in the case of one very slightly albuminous urine. This method of testing for albumin is nearly, though not quite, as delicate as No. 1.

3. *Nitric acid and magnesium sulphate* (Roberts's reagent)[1].—This is prepared by adding one volume of seventy per cent. nitric acid (specific gravity 1.42) to five volumes of a saturated solution of magnesium sulphate. The solution is placed in a test-tube and an equal bulk of urine cautiously added, so as to form a layer. If albumin is present, an opalescence will appear at the zone of contact. This test is in every respect inferior to No. 2 and, moreover, gave clouds in six out of the eighteen normal urines.

4. *Acetic acid and sulphate of soda* (Hoppe-Seyler[2]). This test is applied by adding, to about eighty minims of urine previously acidulated with acetic acid, an equal volume of a saturated solution of sodium sulphate and raising the mixture to boiling. A white precipitate or cloud indicates albumin. This test is given preference by Struve,[2] but in this examination it was found to give a very slight reaction with one normal urine, whilst, on the other hand, one slightly albuminous urine failed to respond. In respect to delicacy it is equal to No. 3.

5. *Hydrochloric acid and salt* (Roberts's brine test)[3].—This reagent is a saturated solution of common salt containing one per cent. of hydrochloric acid. It was first proposed by Roberts, but has since been abandoned by him because of its liability to give precipitates in non-albuminous urines. It was found to give reactions with three normal urines. In delicacy it was inferior to any of the preceding and about equal to the heat and acetic acid test.

6. *Picric acid test.*—This was first employed by Galipe,[4] and more recently has been strongly recommended by Johnson,[5] Saul[6] and others. To the filtered urine, free from mucus, under examination an equal volume of a saturated aqueous solution of picric acid is added, when if albumin is present a heavy precipitate will form. As Jaffe[7] has pointed out, picric acid will induce in normal urine, especially on standing, a precipitate consisting of uric acid and of the picrate of the double salt of potassium and creatinin. These, however, are both readily soluble on warming, whereas the albumin precipitate is insoluble. Hence in applying the test any precipitate that appears should be heated. Hemi-albumose and peptone yield precipitates with picric acid which are distinguished from that of serum-albumin by dissolving upon the application of heat. It produced a slight cloudiness in three out of

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1 Laache: Harnanalyze, 1885, p. 65.
2 Zeitschrift f. Anal. Chem., 1871, 11, 30.
3 Lancet, 1882, 2, 823.
4 Pharm. Zeitschr. f. Russl., 13, 683
5 Lancet, 1882, 737; 1886. Brit. Med. Journ., Oct. 1884.
6 Pharm. Journ. and Trans., 17, 855.
7 Zeitschr. f. physiol. Chemie, 10.

eighteen specimens under examination and in delicacy was found to equal No. 2, the nitric acid contact test.

7. *Picric acid* (Hager's modification[1]).—This is applied by adding five drops of pure hydrochloric acid to two and a half drachms of the urine, and then a layer of about one-half its volume of a cold saturated picric acid solution. If even a trace of albumin is present, a cloud will appear at the place of contact. In sixteen specimens it was found to yield precipitates which consisted chiefly of the characteristic groups of needles of creatinin picrate. This modification cannot be said to possess any advantage over picric acid alone.

8. *Acetic acid and potassium ferrocyanide* (Bödeker's reaction).—This test is regarded by Hilger[2] as one of the most delicate, if not most conclusive, of albumin tests, and in this examination it showed a reliableness thoroughly in accordance with its previous reputation. It certainly deserves a prominent position along with the heat and nitric acid test and is equally delicate. It gave only a very slight cloudiness in one instance. To apply the test the urine is acidulated with acetic acid, and then a few drops of potassium ferrocyanide added. Hemialbumose likewise yields a precipitate, but peptones do not.

9. *Trichloracetic acid.*—Raabe[3] has highly recommended the use of this compound as a reagent for albumin in urine. A crystal of the acid is added to about sixteen minims of the clear filtered urine, and as it dissolves it yields a clouded zone if albumin is present. Normal urine is said to give a similar reaction in the presence of urates. Nine specimens of urine out of the eighteen under examination gave distinct clouds. In delicacy it is equal to No. 4.

10. *Haslam's ferric chloride test.*[4]—The urine is acidulated with acetic acid, a few drops of sodium chloride added and then a layer of ferric chloride. If albumin is present a white cloud is said to form at the zone of contact. Precipitates were obtained by this test with all of the urines. It is not a delicate reagent even for pure albumin solutions.

11. *Méhu's reagent.*[5]—This consists of one part phenol, one part acetic acid and two parts water or alcohol. It has been examined by Simon,[6] and is considered by him as the most delicate and trustworthy reagent for albumin. In my examination it proved itself to be as reliable as Haslam's test, inasmuch as it also gave precipitates with the entire eighteen urines. In delicacy it is equal to Roberts's brine test.

12. *Mercuric chloride.*—A five per cent. solution

[1] Pharm. Centralhalle, 20, 337.
[2] Archiv. d. Pharm., 206, 388.
[3] Pharm. Zeitschr. f. Russl., 20, 445.
[4] Chem. News, 47, 239.
[5] Journ. de Pharm. et de Chim., 9, 95, 1869.
[6] Journ. de Méd. de Paris, 1887, 31.

was employed, and when applied to pure solutions of albumin it was very delicate, probably more so than the heat and nitric acid test; but in testing urine it is worthless, inasmuch as it gave precipitates with the entire eighteen samples.

13. *Potassium mercuric iodide.*—The use of this alkaloidal reagent as a test for albumin has been recommended by Tanret,[1] not only for qualitative but also for quantitative purposes. It produced cloudiness in sixteen out of eighteen urines under examination. Otherwise it is as delicate as No. 12.

14. *Potassium xanthate.*[2]—This gave precipitates with only four urines, but is not a delicate reagent.

15. *Tannic acid.*—Like the solution of mercuric chloride, it is inapplicable in testing for albumin in the urine. It gave precipitates with the entire eighteen specimens.

16. *Sodium tungstate.*—This is also one of the most sensitive reagents for albumin when in pure solution, but is worthless when examining urine. It gave clouds in seventeen cases.

From what has been said in regard to these different tests, it will be seen that the number of those which are really applicable for testing for albumin in the urine is very small and, indeed, can be restricted to only four. These in respect to their delicacy and applicability can be arranged in the following order.

1. Warming with subsequent use of nitric acid, not acetic acid. This test, if properly used, will give as distinct reaction for minute traces as the most delicate alkaloidal reagent.

2. *The nitric acid and contact method.* This test is almost as delicate as the preceding and is free from any source of error.

3. Acetic acid and potassium ferrocyanide. This is a very sensitive reagent, and does not produce, in normal urine, any precipitate, or at most, in isolated cases, a slight cloudiness.

4. *Picric acid.* This reagent cannot be said to be as delicate as either of the three preceding, and, moreover, the number of normal urines with which it gives reactions is quite considerable.

CASE OF A MINIE-BALL EXTRACTED FROM THE PELVIS TWENTY-THREE YEARS AFTER THE WOUND.

Healing of the Fistulous Fecal Track Afterward by Injections of Dilute Carbolic Acid and Iodine.

By T. L. OGIER, M.D.,
OF CHARLESTON, S. C.

Je le pansai et Dieu le guerit was the axiom of the celebrated Ambrose Paré on the recovery of some of his most serious and hopeless cases of surgery. And where is the experienced surgeon who has not

[1] Centralbl. f. d. med. Wissensch., 1877, 493.
[2] Zeitschr. f. Anal. Chem., 21, 579

felt the force of this truth; how often have we seen it in cases of abortion or premature delivery, when the placenta or parts of the fœtus were retained in spite of all our efforts to extract them until the decomposition of the fetor was so great as to make us dread septicæmia and fatal results; yet to find our patient recover without our sad apprehensions being realized, and the reverse in another, and under similar circumstances, when extraction has been easily and thoroughly done, and all antiseptic precautions have been strictly observed to find our patient feverish, the skin pale, temperature high, finally delirium and death from blood poisoning.

This sometimes occurs in other cases notwithstanding the great improvements of antiseptic surgery which now enable us to perform, successfully, operations which before were considered impossible. The great advantage of this system in all cases of surgery and gynecology is so evident that nearly all surgeons now give their patients the benefit of it, but yet patients will die when we do not expect them to, and get well when it seems as if they must die.

The following case verifying the axiom, "*Je le pansai et Dieu le guerit*," I think worth reporting for the following reasons: first, that the patient did not die from the immediate effect of his wound; second, that the ball with bone imbedded in it should have remained in the body for twenty-two years with a sac or cellular tissue forming around it; but, instead, travelling in several directions, coming to a place where it could be diagnosed and extracted successfully, and, finally, the complete obliteration of the fistulous tract by compound iodine injections; healing of the external wound, and the restoration of the patient to health.

CASE.—In one of the last battles of the late war, just before the surrender (at Appomattox Bridge), Capt. L. I. W. received a wound on the left side, three inches below the middle of the crest of the ileum, the ball crushing through the bone at this point was lost in the pelvis. Urine is said to have flowed through the external wound and bloody urine was passed, naturally, for some days after.

Capt. W. remained in hospital about six weeks, during which time his improvement continued; finally, the external wound healed, and his urine became clear, and he left for his home in Charleston.

After he arrived here he suffered little from the wound and attended to his business as rice and cotton factor, but a year later he complained of some trouble in his bowels, the feces came apparently to a certain point in the bowel, but would come no further. I prescribed warm salt and water injections which relieved him; some months after this he complained of the same trouble, and upon introducing my finger into the rectum, high up, I discovered a hard lump on the back and left side of the rectum and pressing on it. By the use of the warm salt and water injections, night and morning, this disappeared, and there was no further trouble for about three years; when, upon pressing with his hand on the lower part of the buttock, he felt and heard a gurgling sound as though there was air in a fluid in the part. Upon examination I found that such was the case, there was no swelling or enlargement of the part, but upon pressing on the buttock just below and within the tuberosity of the ischium a distinct gurgling could be felt and heard; how to account for it I could not, but that there was a sac containing the ball or some foreign substance I had no doubt; how the gas or air got into it I could not see, for if it came from the bowel fecal matter would enter the sac, a fecal abscess would be formed and open either into the rectum or point externally. Nothing of this kind occurred, the patient felt no pain or inconvenience and went about and attended to his ordinary duties, the bowels were regular and the appetite good, still the gurgling could be made evident by pressure.

In about six weeks this ceased to trouble him and it disappeared, and I saw him no more until May 8th, last, when he sent for me in consequence of feeling a hard lump when he pressed hard on the inner side of the tuberosity of the ischium.

On examination just about one and a half inches external to the right end of the usual incision in the perineum, made when operating for calculus, a hard lump could be felt. It was evidently the ball or a piece of bone knocked off by it, so placing the patient over the back of a chair with his hands resting on the seat of it, an incision about three and a half inches long was made in the skin, deepened gradually until the knife touched the foreign substance. This was then laid bare so as to admit of its being seized and I introduced the forceps and extracted it.

It proved to be a minie-ball split from the point nearly to its base by a piece of bone which it grasped firmly.

There was very little hemorrhage, and about two or three ounces of a bloody fluid escaped; the depth of the wound from the skin to the ball was three inches, in length three and a half inches.

After all oozing had ceased the wound was washed with a solution of chloride of zinc, a small tent introduced into the inferior end of the incision to act as a drainage, the lips drawn together and kept in place by rubber plaster, a layer of carbolated cotton was laid over this and secured by a bandage around the pelvis; fluid continued to flow from the lower end of the wound along the drainage-tent, the patient feeling no inconvenience.

On the fourth day the dressings were removed, the lips of the wound united down to the situation of the tent. A seidlitz powder was now given as the

bowels had not been moved since the operation; this acted freely and comfortably and everything went on satisfactorily and naturally, the patient having an operation from the bowels every twenty-four hours, until the ninth day, when our patient had a chill, became feverish and lost his appetite. Three grains of quinine were given three times a day; chicken-broth and beef-tea only for nourishment.

No second chill followed, and on the eleventh day pulse became natural, but on the twelfth day distinct fecal matter was mixed with the fluid discharged from the wound, and upon giving an enema, the water of the injection came through the wound as well as through the anus when the patient made an effort of defecation. The rectum was now well washed out with warm water and explored by the finger with a probe in the external wound without success, but upon pushing the finger very high up near the upper part of the sacrum, a slight depression could be felt, and by bending a long probe and introducing it from the wound, it entered through this depression into the rectum, and felt there by the finger, thus showing a complete fistula.

The opening in the gut was six inches from the anus and ten inches from the wound made for the extraction of the ball.

With the internal orifice of the fistula so high up in the rectum, and the external opening four inches from the anus and ten inches from rectal opening it was a serious consideration as to the proper means to be used for its care. To have operated by laying the rectum open from the internal to the external opening I do not think would have succeeded, and certainly could not be thought of in the present condition of the patient's health; for, since his chill of the ninth day, after the operation his appetite never fully returned, and he lost flesh and was pale and feeble, so we determined to build up his strength by quinine, tonics and nourishing foods; keep him in bed entirely, wash out the wound and keep it clean, inject the canal with a solution of iodine and carbolic acid, and insert a tent dipped in a solution of iodine and carbolic acid, double the strength of the injection up the opening in the rectum, this tent to remain in until the following day; if it was expelled, another was to be inserted immediately after cleansing the canal.

The treatment was kept up for several weeks, the canal becoming narrower, and only slight traces of fecal matter in the discharges from the wound. The iodine solution was now made a little stronger and used for a week, but not thrown up with much force; by the fourth week no fecal matter was perceived, and the fluid discharge from the fistulous track was so slight that the compound iodine injections were stopped entirely and the tent introduced for only one-half inch, for three more days, then the lips of the wound allowed to heal entirely; the patient feeling perfectly well and having operations from his bowels without any inconvenience.

In the seventh week from the time of the extraction of the ball he left the city for the mountains, where he regained all his lost strength and returned in five weeks more a well man.

Many cases of fistula in ano have been treated by injections, but as far as I know of, had to be operated on for their final cure.

The operation of laying the fistulous track open from the upper to the lower orifice, keeping the surfaces from contact until the space fills up, is considered the cure for fistula in ano. In this case the direct cause of postponing any operation was the patient's feeble condition, not wishing to cause additional irritation to his system, and even with his system in good condition it is very doubtful if the wound in the rectum so high up would have closed or the extensive fistulous track ever have healed. That my patient should, under the above treatment, have recovered was most gratifying and unexpected. "*Je le pansai Dieu le guerit.*"

In a similar case I should try the same treatment and hope for the same result.

MEDICAL PROGRESS.

The Treatment of Chronic Constipation.—According to the experience of BUELER, of Berne (*Corr. Bl. für Schweiz. Ærzte*, 1888), the most effective remedy in the treatment of chronic constipation is massage of the abdominal walls. This does not imply a mechanical, indiscriminate following of the movements directed by various authors, but the massage is to be differently conducted with regard to the varying causes of the constipation and the individuality of the case. If the trouble is essentially due to deficiency of the abdominal tension, with relative integrity of the muscular layer of the intestine, deep, powerful massage is indicated at the beginning, to arouse reflex contractions of the recti abdominis. If, however, there is atony of the intestinal muscular layer, as in the case of those of sedentary occupation and little muscular exercise, the muscles of the abdominal wall should be irritated as little as possible, but made tolerant of the massage by gentle stroking of the surface with the flattened hand. It is only later that the abdominal walls of such patients may be energetically manipulated. If dyspepsia be the cause of the constipation, massage of the epigastric region will be of good service in propelling the food onward. In several cases of the kind, in which the ingesta ordinarily remained in the stomach for more than two hours, by methodical massage of the epigastric region the food was forced into the duodenum within five or ten minutes, as demonstrated partly by washing out the stomach and partly by the salol test of the urine. In constipation in consequence of neurasthenia, irritation of the skin and ice-bags to the abdominal walls are indicated. Also in constipation resulting from chronic peritonitis and perityphlitis has massage been effective. In all, the author has thus treated twenty cases of chronic constipation, eighteen with permanent success. In one case a relapse occurred.

One case resisted treatment and was discharged as incurable. As a rule, a cure was effected within four to six weeks in eighteen to twenty-five sittings. In explanation of the efficacy of the method, the following are to be considered: 1. The mechanical effect, the stimulating secretion of the intestinal glands, and propelling onward the intestinal contents. 2. The reflex effect, particularly in nervous individuals, at times the muscular layer being more or less intact. 3. The rise in the temperature of the blood of the organs manipulated, at times reaching 1.8° to 5.4° F. 4. Perhaps a chemical action, induced by the accumulation of CO_2 in the veins of the intestinal tract in consequence of the venous hyperæmia of the peritoneum caused by the manipulation. At the same time the peristalsis is increased.—*München. Monatsh.*, August, 1888.

Treatment of Aneurisms.—M. GERMAIN-SÉE highly extols the simultaneous use of iodide of potassium and antipyrine. He finds that the latter drug effectually quiets the tumultuous cardiac action, favors the formation of the clot and dissipates, to a remarkable degree, the dyspnœa and terrible pains.

DUJARDIN-BEAUMETZ, while recognizing the high value of antipyrine, finds that its continuous use brings out an eruption, and for that reason he prefers phenacetine, which is never toxic and as efficient as antipyrine. —*L'Abeille Médicale*, August 20, 1888.

Treatment of Ununited Fractures.—In the *Reforma Medica* of August 14th a case is related, in which PROFESSOR LORETA successfully treated an ununited intracapsular fracture of the neck of the femur, by scraping the fractured surfaces and inserting a bundle of metallic sutures between them. On January 23d, a robust man, aged thirty-six, was admitted into the Bologna clinic with the history of a fall on the left hip nineteen months previously, since which he had been quite unable to stand, and had suffered from constant severe pain, shooting from the left hip-joint into the gluteal region, the point of greatest intensity being over the course of the sciatic nerve. The limb was much wasted, but it was normal in position, and scarcely at all shortened. Flexion and extension of the thigh on the pelvis were almost impossible, but the patient could occasionally execute very slight movements of rotation and abduction. In rotation, he was sometimes conscious of faint crepitus in the trochanteric region. On February 15th, Prof. Loreta operated with full antiseptic precautions. He made a long incision behind the great trochanter, so as to expose the capsule of the joint, when he noticed a depression between the intracapsular and extracapsular portions of the neck of the femur. On moving the limb, it was found that there was a fracture without displacement in that situation. The capsule was then opened, the fibrous tissue between the fragments divided, and the fractured ends carefully freshened by scraping with a raspatory. As it would have been very difficult to wire the fragments, a bundle of from eight to twelve metallic sutures was introduced between them, and brought out at the lower angle of the external wound. The wound was carefully cleansed, a drainage tube inserted, the edges brought together with deep and superficial interrupted sutures and the whole covered with a sublimate dressing. A long outside splint was then applied. Five days after the operation, the bundle of metallic sutures was removed, and the wound healed by first intention. In less than a month the pain had permanently ceased, and fifty-five days after the operation the patient left the hospital, being able, not only to stand, but to walk with no further support than an attendant's hand.—*British Medical Journal*, August 25, 1888.

Creolin as a Mouth Wash and Gargle.—SCHNITZLER recommends (*Internat. klin. Rundschau*, No. 27) creolin in obstinate forms of angina follicularis, to be brushed or powdered. The taste is unpleasant.

℞.—Creolin . . .	1 or 2 parts.—M.
Aquæ destil. vel.	
aquæ menth. pip. .	100 to 500 parts.
S.—As gargle.	
℞.—Creolin . . .	1 to 5 parts.
Aquæ dest. . . .	50 to 100 parts.—M.
S.—Apply with a brush.	
℞.—Creolin . . .	1 to 5 parts.
Acid. boric. . .	10 parts.
Ol. menth. pip. . .	q. s.

—*Deutsch. medicin. Wochenschr.*, August 16.

Septic Onychia.—This disease, which never gets well by itself and resists even heroic surgical treatment, can be entirely cured, according to FROTTIER, by antiseptic treatment. He washes the sore with a twenty per cent. solution of phenic acid and covers with iodoform. If the nail is acting as a foreign body, it is carefully removed before the application of the dressing, which is removed every four days, and a fresh one substituted. About three months is required for the perfect reproduction of the nail.—*L'Abeille Médicale*, August 13, 1888.

Salicylic Acid in Metrorrhagia.—DR. FELICI has found salicylic acid arrest the flow in two cases of metrorrhagia in a wonderfully short time, and thinks it should be tried extensively by other medical men in similar cases. His first case was one of carcinoma in which the hemorrhage had been constant and profuse, and had defied all ordinary styptic remedies; a plug of carbolized cotton wool, soaked in a solution of salicylic acid, was applied to the uterus, and completely arrested the hemorrhage within a few minutes. The second case was one of simple metrorrhagia during the menopause, but of so violent a character that the patient became collapsed. Ordinary remedies were tried, with merely temporary effect. Finally, Dr. Felici introduced into the uterus a dossil of cotton wool soaked in a concentrated solution of salicylic acid on the end of the uterine sound. This arrested the hemorrhage in a few seconds and no return occurred.—*Lancet*, August 18, 1888.

The Treatment of Syphilis by Injections of the Yellow Oxide of Mercury in Comparison with Calomel Oil.—KÜHN, of Cottbus, states (*Deutsch. medizin. Wochenschr.*, August 2,) that it is generally conceded that injections of calomel are highly useful in the treatment of syphilis. The formation of abscesses is entirely obviated by suspension of the remedy in oil. To determine the relative value of this method of treatment, for almost a year he has largely used injections of the yellow oxide of mercury. Four hundred and twenty-five injections were made in seventy

persons. There were almost exclusively present the affections of the skin and mucous membranes of secondary syphilis. The eruption was always waited for. Topical treatment was avoided. The author has found the results good, but the action not so efficient as after calomel. It appears that four to six injections of calomel have the same effect as six to ten of the yellow oxide. While six, in individual instances, twelve, injections of calomel suffice, twelve to twenty of the yellow oxide are necessary. The following suspensions were used: 1. Calomel vapor parat. gr. xv, olei oliv. optim., ℥ss; 2. Hydrar. oxidg. flav, gr. xv, olei oliv. optim., ℥j. Though it must be conceded that injections of calomel oil are less efficient than those of calomel, on the other hand the reaction following the former are slighter. Abscesses do not form; nor is there notable induration. Stomatitis, which occurred in six cases, was readily checked, so that withdrawal of the treatment was unnecessary. It is believed that with care, barring any special susceptibility to mercury, stomatitis can be entirely avoided. Induration was infrequent. When it occurred, it developed on the day succeeding the injection, disappearing in three to five days. At the time of injecting there was a little pain as in the case of calomel. Comparing the 425 injections of yellow oxide with 272 of calomel as regards reaction, the result is in favor of the former. A number of patients were given injections of yellow oxide and calomel in succession, without recognizing any difference in the fluids used. They volunteered the information, however, that the pain following the calomel injection was the more intense; the induration was more extended, persisting from eight to twelve days, while in the case of the yellow oxide it disappeared in three to five days. The author, in his experiments, used the simplest means, as made necessary during the office hours of a busy practitioner. The strictest antisepsis was observed and the injections were made deeply into the muscles. The patients could not obtain rest of a few hours after the injections, as, on account of the nature of the disease, they desired to avoid conspicuity and any interruption in the pursuit of their avocations. The injections of both preparations were made under precisely similar conditions, so that the comparison ought to furnish accurate results. In conclusion, the author adds that injections of yellow oxide of mercury are certainly very effective, though inferior to inunctions and calomel injections. They commend themselves for their convenience of application, causing locally or constitutionally no complications. They are, therefore, especially adapted to the treatment of walking cases, and are to be preferred as being more convenient, cheaper, more easily managed and less likely to attract attention to the patients. The author usually begins the treatment with the yellow oxide and, if the symptoms speedily disappear, so continues it. The oxide seems specially adapted for slight relapses, in the after-treatment and prophylaxis, viz., to prevent fresh eruptions. Calomel oil was used when the symptoms yielded too slowly to the initial treatment with the yellow oxide and in severe relapses. It is recommended that calomel injections be not entirely excluded from the early treatment, because with fewer injections the less frequent visits of the patient constitute no slight advantage. The injections are suited to the strong and insusceptible. On the other hand, mild relapses in those who bear the injections well might be treated with calomel.

The Antiseptic Influence of Iodoform, the Ethereal Oils and other Substances. The Compression of Gaseous Antiseptics into Gelatin.—As the result of a series of experiments, RIDELIN (*Archiv. f. Hygiene*, Bd. 7, S. 309) arrives at the following conclusions:

1. Iodoform acts either as an almost indifferent powder or as a weak antiseptic against the various rod-shaped bacteria. Against cholera vibriones, however, it is a powerful antiseptic, its vapor inhibiting their growth, in ten per cent. solutions of gelatin to the depth of one-fifth to two-fifths of an inch.

2. Oil of turpentine, in one per cent. emulsion, actively inhibits bacterial vegetation. Gelatin cultures, to which is added turpentine 1 : 200, are not adapted to the development of rod-shaped bacteria. On the other hand, a one per cent. emulsion of turpentine does not suffice to destroy the spores of splenic fever. Turpentine itself is actively antiseptic, in a ten per cent gelatin solution finding its way to a depth of three-fifths of an inch, preventing any development in this area.

3. Among the other oils which are antiseptic are those of lavender, eucalyptus and rosemary, but they do not make up into active emulsion. They are themselves distinctly antiseptic. The first two invade a ten per cent. gelatin solution to a depth of two-fifths of an inch, the last to a depth of three-fifths of an inch, and inhibit vegetation to these extents respectively.

4. Of the remaining ethereal oils, oil of olives possesses the strongest antiseptic power. All others, as the oils of thyme, fennel, peppermint, anise and juniper, and camphor are of minor importance as antiseptics.

5. Iodol has proven to be an inefficient, indifferent powder against bacteria.

6. Balsam of Peru is a pretty active antiseptic, acting with peculiar energy upon the cholera vibrio. Placed upon a ten per cent. solution of gelatin, it invades to the depth of three-tenths of an inch and inhibits vegetation.

7. Sodium sulpho-ichthyolate in a five per cent. watery solution has but a weak antiseptic influence.

8. Anilin and saturated anilin water possess conspicuous antiseptic properties. A ten per cent. solution of gelatin, to which one-fifth of anilin water has been added is unfit to support bacteria.

9. The experiments upon the compression of gaseous antiseptics into gelatin have shown that gelatin is no inert substance, but that peculiar and extensive diffusive processes take place in it.—*Centralbl. f. die ges. Therap.*, August, 1888.

Nitroglycerin in Migraine and Cephalalgia.—TROUSSIÉVITCH (*Bulletin Médical*, No. 35) has had favorable results from the use of nitroglycerin in sea-sickness, and particularly in that form of migraine dependent upon contraction of the vessels, especially in those cases in which the pains occur in paroxysms, are increased by compression of the carotids, are diminished by recumbency, and in which, during the seizure, the face is pale. Nitroglycerin is contraindicated in cephalalgia, the result of passive cerebral hyperæmia. The best mode of administration is by dropping a one per cent. solution upon the tongue. Beginning with one drop, to test the susceptibility of the patient, a drop may be added every third day, as necessity demands.—*Deutsch. medicin. Wochenschr.*, July 26, 1888.

Incision of Swollen Optic Nerve Sheath.—MR. BRUDENELL CARTER, at the recent Glasgow meeting of the British Medical Association, gave an account of a method which he had devised of opening the sheath of the optic nerve behind the eye, for the relief of pressure within this sheath and within the cavity of the skull.

The brain is invested by firm membranes, which secrete a certain amount of fluid, and are continued down to the eye in the form of a sheath, which surrounds the optic nerve; and, whenever the pressure within the cavity of the skull is increased, as by the growth of a brain tumor, or even by excess of secretion from the membranes themselves, a superabundance of fluid is apt to find its way down the nerve sheath to the level of the eye, to subject the optic nerve to injurious pressure, and, in many cases, to destroy the sight. It not infrequently happens that the pressure within the brain cavity may be increased by temporary or curable causes, which, nevertheless, continue in action sufficiently long to produce permanent blindness, even although the patient may, in other respects, recover.

In view of these conditions, it was suggested by Dr. de Wecker, of Paris, sixteen or seventeen years ago, that it might be possible to open the optic nerve sheath, and thus not only to relieve the nerve from pressure, and to preserve it from injury, but also, on account of the position of the eye relatively to the brain cavity, to drain the latter by gravitation, and to relieve the brain as well as the eye. Dr. de Wecker made two endeavors to accomplish this object, but he tried to feel his way to the optic nerve without the aid of sight, and to incise the sheath by means of an instrument carrying a concealed knife, capable of being projected by means of a spring. The risks of failure, and, still more, the risks of inflicting irreparable injury upon the nerve, were such that he only attempted his operation in two well-nigh hopeless cases, and only one attempt to follow his example has been recorded.

Mr. Carter's attention was called to the matter last year by a case in which the diminution of pressure within the optic nerve sheath was manifestly desirable; and he devised a method of operating by which the sheath could be exposed to view, and the object attained with certainty, under the guidance of sight at every step of the process. He read before the Medical Society of London, last year, an account of the first case in which he operated, which was successful. The external rectus was divided, the eyeball then rotated inward, the sheath of the optic nerve was exposed and opened, and gave exit to the contained fluid. He read an account of three more cases at Glasgow, in one of which the result was negative, as far as sight was concerned; while in the other two the patients were not only quickly restored to useful vision, in one instance from complete, in the other from nearly complete blindness, but were at the same time relieved or cured of other symptoms, such as headache and sickness arising from direct pressure on the brain.

In his paper at Glasgow, Mr. Carter claimed for the new operation that it could be performed with certainty and without risk either to life or to any important structure, and that it afforded a reasonable prospect of the preservation of sight in many forms of disease in which it is now habitually or frequently lost. As in the case of every new operation, time and further experience of its effects are required in order to determine the precise limits of its usefulness. In the discussion which followed the paper, Mr. Bickerton, of Liverpool, said that, in consequence of reading the account of Mr. Carter's first case, he had himself performed the operation in two instances, in one of which temporary restoration of sight was followed by relapse, while in the second the ultimate issue was favorable.

Wound of Left Ventricle.—KIANKOFF relates the case of a Cossack who was wounded in his left side at the fourth intercostal space, the blade entering the heart. The wound was cleansed and dressed with a compress. The patient regained consciousness the next day and lived for four weeks. He finally died from attempting to lift a heavy load. The autopsy disclosed a wound in the left ventricle. The pericardium was full of dark bloody matter.—*L'Union Médicale*, August 4, 1888.

New Vesicant.—DR. BONI, in *Union Pharmac.*, recommends the following:

Camphor	2 parts.
Chloral	30 "
Cantharides	10 "

The camphor and chloral are first mixed in a mortar and then warmed. The tincture of cantharides is added last and then thoroughly shaken for fifteen minutes. This preparation is less volatile than the cantharidal collodion, and is especially useful in cases of women and children.—*Journal de Médecine de Paris*, Aug. 12, 1888.

Angina Pectoris.—HECHORD highly recommends the subcutaneous injection of nitro-glycerin; he uses forty drops of a one per cent. solution in alcohol in half an ounce of water, and regulates the dose in accordance with the requirements.

This method, while not curative, greatly ameliorates the suffering and diminishes the frequency of attacks, if perseveringly followed.—*Revue de Thérapeutique.*

A Case of Sudden Blindness.—NOTHNAGEL (*Wiener med. Blätter*, No. 20, 1888) relates the case of a man, forty-six years of age, who, always in good health, barring occasional headache, suddenly became blind, with fully retained consciousness. The somewhat demented patient showed entirely healthy internal organs; the ophthalmoscopic examination was negative, the pupils of varying size, the right somewhat slower to react than the left. A test of the visual field disclosed hemiablepsia superior, though the inferior range of the field was not unimpaired, for only the colors red and white were distinguished and there was no appreciation of the size of objects. The author believes that there was a lesion of the visual field in the cerebral cortex in the occipital lobe. He had already observed simultaneous disease of both occipital lobes, confirmed at the autopsy. The reflex irritability of the pupils excluded a lesion of the optic thalamus or of the corpora quadrigemina.—*Medicin. Chirurg. Rundschau*, August 1, 1888.

Methylal as an Hypnotic.—M. BOURBILA has been experimenting with this drug and, in certain nervous affections, prefers it to chloral, urethan or opiates.

In epilepsy and mental disturbance due to organic lesions, it has proved of value.

Its solubility, harmlessness and pleasant taste and odor unite in making it a superior hypnotic.—*Gazette Hebdomadaire des Sci. Méd.*, August 18, 1888.

The Medical News.

A WEEKLY JOURNAL OF MEDICAL SCIENCE.

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SATURDAY, SEPTEMBER 15, 1888.

THE SURGICAL TREATMENT OF INTUSSUSCEPTION.

The discussion upon the treatment of intestinal obstruction at the coming meeting in Washington of the Congress of American Physicians and Surgeons, will doubtless prove to be the auspicious event of the year, in the line of abdominal surgery. And we may certainly expect that it will put many of the at present mooted questions of diagnosis and surgical interference at rest or at least upon a much more substantial and practical basis.

Mr. Arthur E. J. Barker has recently successfully and brilliantly operated upon a case of intussusception of the cæcum, ascending and transverse colon, which he reports in the *Lancet* of August 11th, together with some very interesting statistics of operative interference in such cases. His case was of unusual interest. A child, four years old, who had always had the very best of health, came under Mr. Barker's care, with indubitable symptoms of intussusception. He had copious bloody stools, accompanied with great straining and tenesmus, severe abdominal pain and peritonitis decubitus. A well-marked tumor could be made out in the left iliac fossa, but could not be defined by rectal examination. An ineffectual effort to reduce the invagination having failed, abdominal section was proceeded with seventeen hours after the onset of the symptoms. As soon as the median incision had been made, a hand was carried into the abdomen and the tumor, not without considerable difficulty, was reduced by adopting a method of reduction recommended from a theoretical standpoint, some years ago, by Hutchinson. This consists in pushing the tumor upward from below and at the same time retracting the ensheathing bowel with one hand, while with the other gentle traction is made upon that portion of the intestine which enters its upper portion. In this case the reduction was mainly accomplished without bringing the mass into view. The involved bowel was œdematous and in places ecchymotic, but otherwise in good condition. The operation was completed in thirty-five minutes; no drainage was used, and the patient made a rapid and uninterrupted recovery.

Barker's statistics embrace preantiseptic as well as thoroughly antiseptically treated cases, and, consequently, whilst they present a somewhat grim appearance as regards success when contrasted with those of other departments of abdominal surgery, still, when we take into account all of the heretofore usual concomitants of this most desperate class of cases, we must be rather more surprised at the recovery record than at the mortality rate. He has been able to collect 63 cases of intussusception of all varieties which were treated by abdominal section—in most of them probably undertaken as a very last resort. Of this total, 38 were children, with a mortality of 87 per cent., and 25 were adults, with a death-rate of 68 per cent.

In all, 13 recovered and 50 died—a mortality of 74 per cent. Section was performed in 34 cases and the bowel released (including Barker's own case), with a mortality of 65 per cent. In 29 cases the intussusception was found irreducible. Of these 29 operations 5 must be classed as exploratory, as no treatment of the invagination was attempted; in 14 the affected bowel was resected, and in the remaining 10 artificial ani were formed. But a single one of these 29 cases recovered—that of an adult whose intussusception was resected.

We think that these figures alone more than justify the author's modest conclusion that a larger array would probably strengthen his belief that abdominal section "compares favorably with other methods of treating this very fatal condition."

Indeed, such a method of treatment should be practically always successful if we could make our diagnosis and operate during an early stage of the disease, before the patient had lost almost all chances which might have been in his favor, through exhaustion and septic absorption.

A METHOD OF WIRING FRACTURES OF THE PATELLA.

THE treatment of transverse fractures of the patella is confessedly unsatisfactory, and the ideal method which will yield a perfect result and expose the patient to no danger has yet to be discovered. Very many different methods of treatment and various forms of apparatus have been devised for the reparation of this injury. Most surgeons are content to use splints in uncomplicated acute cases and are measurably satisfied with their results. A few use Malgaigne's hooks, hoping thereby to gain a closer union of the fragments, and claim good functional results. Others who worship at the shrine of Listerism, boldly advocate and practise incision into the joint, removal of interposed fibrous tissue, clots, and effusion and the immediate approximation of the fragments with wire. By all of these methods good functional results have been obtained, and under all have there been many failures. When splints alone are used union occurs through the interposition of fibrous tissue, which if not more than half an inch in length is probably as useful as if the continuity of the bone had been entirely restored. Even when the separation is much greater, there is usually but slight disability; and the crowning virtue of the treatment is its perfect safety.

On the other hand, the advocates of incision and wiring do usually obtain bony union, good functional results and a marked shortening of the time of treatment; but it cannot be said that the method is free from danger, either to life or limb. In some cases inflammation, suppuration and necrosis supervene, in some amputation of the thigh becomes necessary, in a percentage, by no means small, death has resulted; and in some which have safely passed these stages, there are stiffness and partial ankylosis of the joint. In view of these casualities many surgeons who are thoroughly imbued with the principles of aseptic surgery, and versed in its technique, have rejected the open incision and immediate suture, and make use of apparatus of various kinds.

As a contribution toward the solution of the best method of treating fractures of the patella, DR. W. L. AXFORD, of Chicago, has devised "A method of wiring fractures of the patella," which is published in the *Annals of Surgery* for July.

In order to limit effusion and abort inflammation, the limb immediately upon the occurrence of fracture should be placed on a posterior splint, and soft sheeps'-wool sponges applied over and to the side of the joint and snugly held in place by a roller bandage. Ice water should be kept constantly trickling upon the sponges for forty-eight hours, at the end of which time the knee will probably be ready for the operation. If the effusion is still too great, it may be removed by Schede's method, and if the fragments cannot be brought together, the ligamentum patellæ may be detached from the tibia. The fibrous aponeuroses should be removed by rubbing the surfaces together or by passing a tenotome between the fragments and separating the interposed tissues. For the purpose of wiring the fragments, a long Brainard's drill is used, the point of which is perforated to allow the wire to be passed. Two drills are necessary. The fragments being held together, one drill is entered from above and passed through the fragments in a direction parallel to the long axis of the limb. The drill is detached from the handle and left temporarily *in situ;* the other drill is passed in the opposite direction from the first, the wire threaded into the eye at its point, and the drill withdrawn bringing the wire with it. The first drill is threaded in the same way and withdrawn, and the wires are twisted. A few layers of gauze are placed over the knee, the twisted ends of the wires pushed through the gauze, and a cap of hard rubber, leather or felt perforated is applied over all. The wires are now twisted tightly and a Bavarian or plastic splint applied.

Dr. Axford thinks this method presents a minimum danger of infection when stringent antisepsis is enforced, and that there is a good chance to obtain bony union. This method, in part of its execution, is very like that advocated by Dr. T. G. Morton, of Philadelphia, a few years ago, and we do not see that it presents any particular advantages over Morton's procedure. Dr. Morton passed his pins as in the above method, and, placing shoulders over their extremities, allowed them to remain. They would certainly approximate the fragments as well as the wires. We think either method preferable to the open section. No operation of this nature should be performed except with the observance of all necessary antiseptic precautions.

THE POISONOUS EFFECTS OF CIGARETTE-SMOKING.

THE experimental investigation by Dr. Dudley of the cause of the poisonous effects of cigarette-smoking, presented on another page of THE MEDICAL NEWS, has led him to ascribe it mainly to carbonic

oxide produced by the process of combustion. The difference in the effects of smoking a cigarette and a pipe or cigar he holds to be due entirely to a difference in the methods of smoking. By the inhalation of the smoke the carbonic oxide is brought in position for absorption in the lungs and acts injuriously upon the blood by deoxidizing it. Were the smoke of a cigar or pipe inhaled in the same manner as that in cigarette-smoking it would be just as injurious. The experiments made upon mice, which were placed in a confined atmosphere thoroughly impregnated with cigarette-smoke, showed that the carbonic oxide quickly destroyed life, proving it to be a most noxious constituent of tobacco-smoke.

Dr. Dudley rejects the explanation that the poisonous action of cigarette-smoking is due to the adulteration of the tobacco with drugs, such as opium, or to arsenic contained in the paper. Nicotianine is poisonous, but it is not peculiar to the cigarette. The deleterious effects of the cigarette-habit are, therefore, not due to anything peculiar in the composition of the cigarette, but to the practice of inhaling the smoke. It follows, therefore, that tobacco-smoking is injurious in proportion as the smoke is inhaled. That the most poisonous constituent of tobacco-smoke is carbonic oxide seems indicated by Dr. Dudley's investigation, but further experimentation may demonstrate a different conclusion.

THE first triennial Congress of American Physicians and Surgeons assembles in Washington next week, and the indications point to a most successful meeting.

THE initial number of a new weekly medical journal, to be called *The Illustrated Medical News*, is announced to be published in London on September 29th. Its distinctive features will be an original colored plate with each number, and numerous woodcuts in illustration of the text.

THE Canadian Medical Association met in annual convention, at Ottawa, during the past week. Among those who were on the programme to present papers were Drs. Howard, Fenwick, Roddick, Alloway, Shepherd, Stirling, Mills, Blackader, Laphthorn Smith, James Bell, Canniff and Playter; also, Dr. Osler, of this city, whose subject was the "Mortality of Pneumonia." The *Montreal Medical Journal* laments greatly that the French-Canadian fraternity has hitherto held aloof from this representative medical body of the Dominion, and earnestly urges that element to put its shoulder to the medical wheel at the Ottawa meeting, to the advantage of every element.

REVIEWS.

LARYNGOLOGY AND RHINOSCOPY IN THE DIAGNOSIS AND TREATMENT OF DISEASES OF THE THROAT AND NOSE. By PROSSER JAMES, M.D. Fifth edition enlarged; illustrated with hand-colored plates. 12mo. pp. 273. London: Ballière, Tindall & Cox, 1888.

To the older laryngoscopist Dr. Prosser James is well known as a pioneer in modern laryngology. The present edition of his manual, much of which has been rewritten, condensed and rearranged, is a marked improvement on the former ones in material, in diction and in illustration. We note a claim for devising the nasal dilator known as Fränkel's, the use of which has done much to stimulate researches in rhinoscopy and to develop knowledge of diseases of the interior of the nose. The subject of intubation of the larynx is given due prominence, and the apparatus of O'Dwyer is well illustrated. Cutting sickle-shaped knives devised by the author are presented as admirably adapted for the excision of certain morbid growths of the larynx, and for excision of the uvula and the tonsils. The Jarvis snare is duly recommended for the purposes for which it was contrived; but for some of them the author has found it more advantageous to use a bent canula instead of the straight one. We notice an illustration of an exceedingly delicate pair of nasal forceps for the removal of foreign bodies. As far as our recollection serves, these are the main, fresh features of this new edition of a valuable little treatise for practitioners entering upon the special study of diseases of the throat and of the nasal passages.

CORRESPONDENCE.

THE SUCCESSFUL PALLIATION OF HAY FEVER.

To the Editor of THE MEDICAL NEWS,

SIR: It may interest some of your readers to hear the details of a palliative treatment of hay fever which has secured almost entire relief to a patient who had submitted to a thorough, yet unsuccessful, course of radical treatment with the galvano-cautery, caustic acids, chisels, saws, etc.

The drugs employed, atropine and cocaine, are well known in connection with this disease, but the mode of their use may be novel. The patient is directed to take $\frac{1}{200}$th grain of atropine sulphate on rising, and to repeat the dose every four hours till bedtime. If any dose fails to check running from the nose, it may be repeated in half an hour. Should dryness of the nose continue longer than four hours, the atropine may be withheld until renewal of the flow. Incipient dryness of the mouth is a safe and convenient indication to use in limiting the dosage of the drug. The effects of atropine are two: First, it diminishes exalted peripheral sensibility, and thus renders the nose less sensitive to the

special irritant cause of hay fever; sneezing is diminished or abolished, and with it a train of distressing symptoms. Secondly, it checks the watery secretion of the nose, and thus prevents washing away of the cocaine before it has practically reached the surface to which it must be applied.

For the local use of cocaine the wire cotton-carrier, shown in the cut, is the most convenient instrument yet devised. It is made of spring-tempered German silver, or brass wire one-twenty-fourth inch thick, with a ring formed at one end, the body curved at right angles to the plane of the ring, and the tip *longitudinally* scratched with a fine file or sand-paper in order to engage the cotton when rotated in it. The total length of the finished instrument is six inches. The wire must, of course, be annealed *near the sharp bends*, by heating red-hot and *suddenly quenching*. Iron or steel wire should never be used on account of its liability to rust and break in the nose. A very small quantity of absorbent cotton is twisted about the tip, care being taken to cover the rounded point, and the patient, holding the convex curve uppermost, passes the little finger into the ring and thereby securely grasps an instrument with which he can convey cocaine to all parts of the nose. The physician should perform the first application, touching the turbinated bones and meati on all their surfaces, paying especial attention to the floor of the nose and the anterior commissure. The space thus reached measures approximately four inches horizontally by two inches vertically in its greatest diameters.

Cotton-carrier. ¾ full size.

During this operation the patient should be directed to notice the variations in sensation, some spots seeming to burn, itch, smart or cause sneezing or lachrymation. These spots should be mentally mapped out by the patient, who thus becomes possessed of a chart of the areas causing his distress. The physician then proceeds similarly with the other nostril and bids the patient to take hold of the instrument while *in situ*, manipulate it for himself, and to withdraw it from its greatest penetration, about four inches. This revelation of his own anatomy inspires confidence, and the physician's assurance that there are no structures in the nose which the patient's sensations will allow him to injure will soon lead to a most surprising ease of self-treatment, with an accuracy of touch and certainty of result impossible for an outsider to attain. With the assistance of atropine internally, weak solutions of cocaine will clear the nose, and therefore relieve other dependent symptoms, such as congestion and itching of the eyes, itching of the roof of the mouth, of the throat, ears and chest, and asthma.

The eyes will rarely need special attention, but in such rare cases they may be gently touched in both corners with a one or two per cent. solution of cocaine on the cotton-carrier, a fresh pledget of cotton being used. For the nose the solution may vary from one-half to four per cent., according to the severity of the case and the time of day, stronger solutions being required on rising and toward evening. It will rarely be necessary to employ a solution stronger than four per cent., a failure of which shows either a failure to reach the peccant area or that the cocaine is being washed away, and therefore indicates another application of cocaine or another dose of atropia.

Compared to this mode of application of cocaine other modes are clumsy, inefficient and wasteful. Atomization and instillation cannot reach the surfaces abnormally jammed together by the engorged bloodvessels, and without this indispensable condition cocaine is worse than useless, because more or less of it will be absorbed by the system, with injurious tendency. This delicate cotton-carrier can separate any surfaces forced together by engorgement, and be allowed to remain in contact with the sensitive spot, while the hands are free for any duty. The camel's-hair brush, which is sometimes used, has a clumsy quill preventing its soft and scattering hairs from reaching the tortuous passages, and it is furthermore dirty and difficult to clean, leading to a rapid deterioration of the cocaine solution. On the contrary, the cotton is readily pushed off the wire with a handkerchief or another piece of cotton, and the wire thus cleansed instantly. The quantity of cocaine used with the wire is very small, two or three grains per day being ample for a severe case. The quantity of atropine, likewise, seems absurdly small, a steady consumption of five granules daily for a month aggregating only three-quarters of a grain. It is very important that the granules of atropine be accurately made. This cannot be done on a small scale and it is therefore best to buy them of a large manufacturing house of good reputation. Wyeth's triturates have been found satisfactory.

The above treatment may be much assisted by general measures. Draughts or exposure to ordinary causes of cold in the head should be avoided, likewise sudden, great changes of light. Dust and respiratory irritants of all kinds are injurious. Sneezing can always be controlled by biting the upper lip, if other means fail, the pain of the bite being increased by a determined effort of will to the point necessary to obliterate the incitement to sneeze. Useless coughing must be strictly repressed. Rapid walking or running upstairs powerfully assist the action of cocaine for obvious reasons, and likewise mental occupation, reading, for instance, often rapidly comforting eyes apparently too photophobic for use. Diet should be ample in quantity, and non-inflammatory in quality. The hours of sleep should be prolonged.

These measures are the result of a large number of experiments, and as they have secured practical immunity to a severe case of twenty years' standing, they are recommended in confidence as a means readily available for every practitioner to use in relieving this opprobrium of his profession. Their applicability is believed to be general, no reason appearing why a patient should not be nearly as comfortable during his period of hay fever as at other times. Polypi or abnormal growths in the nose should, of course, be removed in any event. With his tiny armamentarium in his pocket the whilom victim has for

three summers fearlessly trampled the rag-weed and breathed through his nose its poisonous pollen, sure of immediate relief from any paroxysm. A. H. L.

September 10, 1888.

NEWS ITEMS.

The University of Michigan.—*The Physician and Surgeon* for September criticises the Board of Regents of this institution for failing to fill the existing vacancy in the chair of Obstetrics and Gynecology and Diseases of Women and Children. The medical faculty had selected and recommended a candidate eminently fitted and qualified for the position; a man who is known and recognized by the medical profession through his writings and his success in the practice of his branch, as one of the leading gynecologists of this country. But the Board was shown one objection to making the appointment which more than counterbalanced all these intrinsic qualifications. Through the reputation of his ability, he has built up a large and lucrative practice in the city of Detroit; and not being willing to sacrifice this and reside in Ann Arbor, the appointment was not made, because it has been decided that in the future all appointees to professorships in the *medical* department must live in Ann Arbor.

It seems as if the regents have an actual fear that by employing men having the reputation of clinical workers and clinical teachers, it might appear that they regarded clinical instruction an essential feature in medical education. To admit this would not be consistent with their persistent neglect to provide facilities for such instruction; their indifference to the requests of those who are faithfully laboring to build up a clinic; and their opposition to the movement that will furnish the medical department with the greatest amount of clinical advantages.

Epidemic Disease.—An important memorandum on the proceedings which are advisable in places attacked or threatened with epidemic disease, which has been drawn up by Dr. George Buchanan, F.R.S., has been issued to sanitary authorities by the Local Government Board. In this memorandum it is stated that, wherever there is prevalence or threatening of cholera, diphtheria, fever or any other epidemic disease, it is of more than common importance that the statutory powers conferred upon sanitary authorities for the protection of the public health should be well exercised by those authorities acting with the advice of their medical officers of health.

Proper precautions are equally requisite for all classes of society. But it is chiefly with regard to the poorer population, therefore, chiefly in the courts and alleys of towns, and at the laborers' cottages of country districts, that local authorities are called upon to exercise vigilance and to proffer information and advice. Common lodging-houses and houses which are sublet to several small holdings always require particular attention.

Wherever there is accumulation, stink or soakage of house refuge or of other decaying animal or vegetable matter, the nuisance should as promptly as possible be abated, and precaution should be taken not to let it recur. Especially examination should be made as to the efficient working of sewers and drains, and any defect therein, and any nuisance therefrom, or from any foul ditches or ponds, should be got rid of without delay. The ventilation of sewers, the ventilation and trapping of house drains and the disconnection of cistern overflows and sink pipes from drains, should be carefully seen to. The scavenging of the district and the state of receptacles for excrement and of dust-bins will require close attention. In slaughter-houses, and wherever animals are kept, strict cleanliness should be enforced.

In the removal of filth during periods of epidemic disease it is commonly necessary to employ chemical agents for reducing or removing the offence and harm which may be involved in the disturbance of the filth. In the removal of privy contents these agents are more particularly wanted if the disease in question be cholera or enteric fever. The chemical agent should be used liberally over all exposed surfaces from which filth has been removed. Unpaved earth close to dwellings, if it be sodden with slops or filth, ought to be treated in the same way.

Sources of water supply should be well examined. Water from sources which can be in any way tainted by animal or vegetable refuse, especially those into which there may be any leakage or filtration from sewers, drains, cesspools or foul ditches, ought no longer to be drunk. Above all, where the disease is cholera, diarrhœa or enteric fever, it is essential that no impure water be drunk.

The liability of leaky pipes to act as land drains and to receive foul matters as well as land drainage through their leaks is not to be overlooked. And such leaky pipes, running full of water with considerable velocity, are liable to receive, by lateral insuction at their points of leakage, external matters that may be dangerous. This latter fact is not recognized so generally as it should be, and ignorance of it has probably baffled many inquiries in cases where water services have in truth been the means of spreading disease.

If, unfortunately, the only water which for a time can be got should be open to suspicion of dangerous organic impurity, it ought at least to be boiled before it is used for drinking, but then not to be drunk later than twenty-four hours after it has been boiled. Filtering of the ordinary kind cannot by itself be trusted to purify water. It cannot be too distinctly understood that dangerous qualities of water are not obviated by the addition of wine or spirits. When there appears any probable relation between the distribution of disease and of milk supplies, the cleanliness of dairies, the purity of the water used in them, the health of the persons employed about them, and the health of the cows that furnish milk should always be carefully investigated. Even apart from any apprehension of milk being concerned in a particular outbreak of disease, it is desirable that English people should adopt the custom, which is always followed in some Continental countries, of boiling all milk at once upon its reception into a house.

The washing and lime-whiting of unclean premises, especially of such as are densely occupied, should be pressed with all practicable despatch.

Overcrowding should be prevented, especially where disease has begun, the sick room should, as far as possible, be free from persons who are of no use to the patient,

Ample ventilation should be enforced. It should be seen that windows are made to open, and that they are

sufficiently opened. Especially where any kind of infective fever has begun. It is essential, both for patients and for persons who are about them, that the sick room and the sick house be constantly traversed by streams of fresh air.

The cleanliest domestic habits should be enjoined. Refuse matters should be speedily removed or destroyed; and things which have to be disinfected or cleansed should always be disinfected or cleansed without delay.

Special precautions of cleanliness and disinfection are necessary with regard to infective matters discharged from the bodies of the sick. Among discharges which it is proper to treat as infective are those which come in cases of smallpox and scarlatina from the affected skin; in cases of cholera and enteric fever from the intestinal canal; in cases of diphtheria and scarlatina from the nose and throat; likewise, in cases of any eruptive or other epidemic fever, the general exhalations of the sick. The caution which is necessary with regard to such matters must, of course, extend to whatever is imbued with them; so that bedding, clothing, towels, handkerchiefs and other articles which have been in use by the sick may not become sources of mischief, either in the house to which they belong or in houses to which they are conveyed. So far as articles of this class can be replaced by rags, or things of small value, it is best to use such things and burn them when they are soiled. Otherwise clothing and infected articles should be subjected to the disinfection of the sick room, or be removed for disinfection by heat.

In enteric fever and cholera the evacuation should be regarded as capable of communicating an infectious quality to any night-soil with which they are mingled in privies, drains or cesspools; and after such disinfection of the mass is practicable, they should be disposed of without delay and under the safest conditions that local circumstances permit. They should not be thrown unto any fixed privy receptacle, and above all, they must never be cast where they can run or soak into sources of drinking water.

All reasonable care should be taken not to allow infective disease to spread by the unnecessary association of sick with healthy persons. This care is requisite, not only with regard to the sick house, but likewise with regard to schools and other establishments wherein members of many different households are accustomed to meet.

If disease begins in houses where the sick person cannot be properly accommodated and tended, medical advice should be taken as to the propriety of removing him to an infirmary or hospital. Every sanitary authority should have in readiness a hospital for the reception of such cases.

Where dangerous conditions of residence cannot be promptly remedied, it will be best that the inmates, while unattacked by disease, remove to some safer lodging.

Privation, as predisposing to disease, may require special measures of relief.

In certain cases special medical arrangements are necessary. For instance, as cases of cholera in this country often begin somewhat gradually in the comparatively tractable form of what is called "premonitory diarrhœa," it is essential that, where cholera has appeared, arrangements should be made for affording medical relief without delay to persons attacked, even slightly, with looseness of bowels, So, again, where smallpox is the prevailing disease, it is essential that all unvaccinated persons (unless they previously have had smallpox) should very promptly be vaccinated; and that revaccination should be performed in cases properly requiring it.

It is always to be desired that the people should, as far as possible, know what real precautions they can take against the disease which threatens them, what vigilance is needed with regard to its early symptoms, and what (if any) special arrangements have been made for giving medical assistance within the district. Por the purpose of such information printed hand-bills or placards may usefully be employed, and in cases where danger is great house-to-house visitation by discreet and competent persons may be of the utmost service, both in quieting unreasonable alarm and in leading or assisting the less educated and the destitute parts of the population to do what is needful for safety.

The present memorandum relates to occasions of emergency. Therefore the measures suggested in it are essentially of an extemporaneous kind; and permanent provisions for securing the public health have, in express terms, been but little insisted on. It is to be remembered, however, that in proportion as a district is habitually well cared for by the sanitary authority, the more formidable emergencies of epidemic disease are not likely to arise in it.

OFFICIAL LIST OF CHANGES IN THE STATIONS AND DUTIES OF OFFICERS SERVING IN THE MEDICAL DEPARTMENT, U. S. ARMY, FROM SEPTEMBER 4 TO SEPTEMBER 10, 1888.

A Board of Medical Officers, to consist of CHARLES H. ALDEN, *Major and Surgeon;* GEORGE M. STERNBERG, *Major and Surgeon;* HENRY MCELDERNY, *Major and Surgeon;* and EDWARD C. CARTER, *Captain and Assistant Surgeon,* is constituted to meet in New York City, on October 1, 1888, or as soon thereafter as possible, for the examination of Assistant Surgeons for promotion, and of candidates for admission to the Medical Corps of the Army.—*S. O. 203, A. G. O.*, September 1, 1888.

WORTHINGTON, J. C., *Captain and Assistant Surgeon.*—Ordered from Fort Crawford, Colorado, to Fort Townsend, Washington Territory.—*S. O. 206, A. G. O.*, September 5, 1888.

HALL, J. D., *Captain and Assistant Surgeon.*—Ordered from Fort Townsend, Washington Territory, to Fort Niagara, N. Y.—*S. O. 206, A. G. O.*, September 5, 1888.

BROWN, P. R., *Captain and Assistant Surgeon.*—Ordered from Fort Niagara, N. Y., to Fort Sidney, Nebraska.—*S. O. 206, A. G. O.*, September 5, 1888.

OFFICIAL LIST OF CHANGES OF STATIONS AND DUTIES OF MEDICAL OFFICERS OF THE U. S. MARINE-HOSPITAL SERVICE, FOR THE TWO WEEKS ENDING SEPTEMBER 10, 1888.

PURVIANCE, GEORGE, *Surgeon.*—To proceed to Fairport, Ohio, as Inspector, August 27, 1888.

MURRAY, R. D., *Surgeon* —To proceed to Key West, Fla., September 5, 1888.

HUTTON, W. H. H., *Surgeon.*—To take temporary command of Camp Perry, Fla., September 8, 1888.

GUITERAS, JOHN, *Passed Assistant Surgeon.*—To proceed to Jacksonville, Fla.; after return from duty, on special train from Jacksonville, to Hendersonville, N. C., September 8, 1888.

BRATTON, W. D., *Passed Assistant Surgeon.*—To proceed to San Francisco, Cal., and report to Surgeon H. W. Sawtelle, for duty, September 8, 1888.

WASDIN, EUGENE, *Passed Assistant Surgeon.*—To rejoin his station at Mobile, Ala., September 5, 1888.

MAGRUDER, G. M., *Assistant Surgeon.*—To proceed to Mobile, Ala., and assume temporary charge of the Service, Aug. 31, 1888.

FATTIC, J. B., *Assistant Surgeon.*—To proceed to Memphis, Tenn., and relieve Passed Assistant Surgeon C. T. Peckham, August 31, 1888.

MAGRUDER, G. M., *Assistant Surgeon.*—To proceed to Way Cross, Ga., September 6, 1888.